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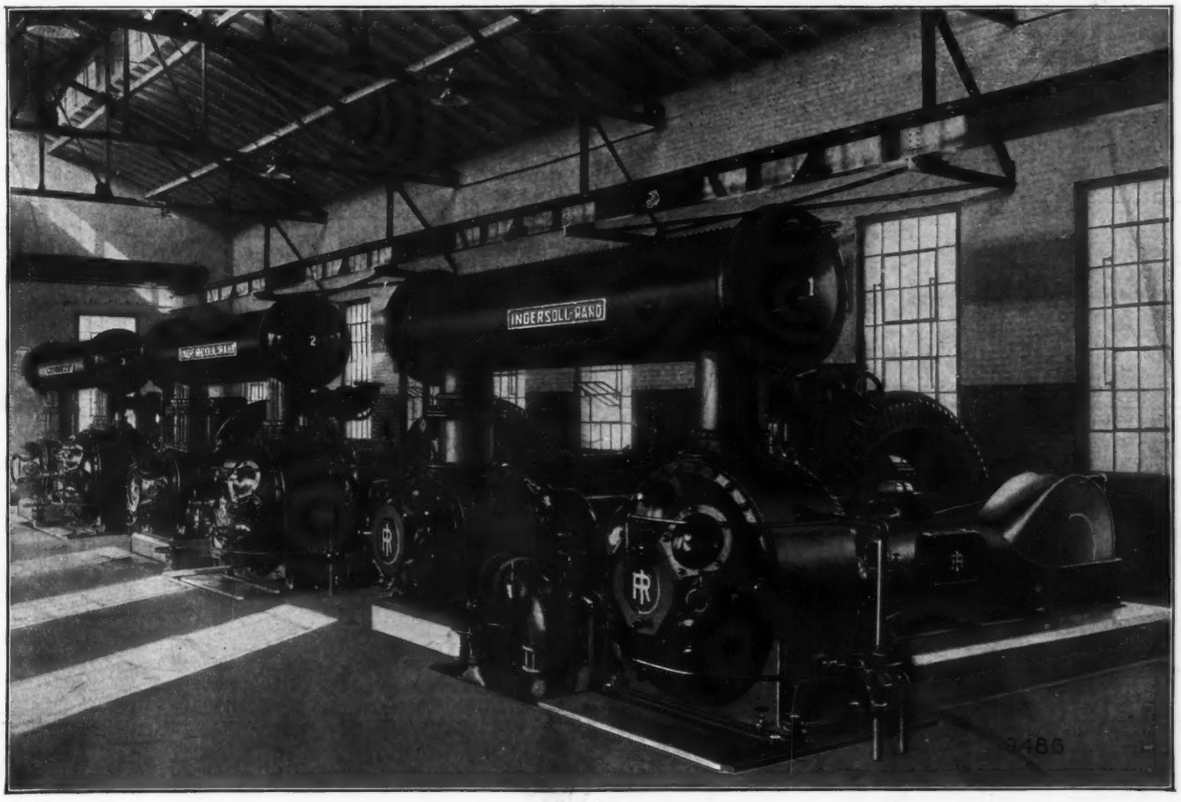

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The S-A Page

Published Weekly in the Interests of S-A Conveying Engineering

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The United States Reclamation Service in the construction of the Lahonton Dam at Fallan, Nevada, adopted an extensive "S-A" Belt Conveyor System for mixing and handling the earth fill, and a separate "S-A" system for concrete materials. The final report of Mr. D. W. Cole, Project Manager, together with the costs covering the operation make very interesting reading. It is reproduced herewith for your information.

The borrow pit is situated from one-fourth to one-half mile from the dam. Material was loaded onto 4-yard dump cars by electric excavators. Seven-car trains were hauled by 14-ton Porter locomotives over 36-inch gauge endless track, car being dumped into bins at about 500 cubic yards capacity under which a 36-inch by 110-foot belt conveyor was loaded by automatic feeders for delivering measured quantities of "silt" and "gravel" for composing the impermeable embankment mixture. The 36-inch belt delivered these materials onto the 30-inch conveyor extending 925 feet from the storage bins to about the middle of the embankment. The total quantity of material handled in this manner was 612,000 cubic yards. The cost of this conveyor system "A" was as follows:

30-in. x 925 ft. conveyor, purchase price	$8,022.00
26-in. x 110-ft. conveyor, purchase price	1,497.00
Automatic feeders, purchase price	1,243.00
	10,752.00
Freight	1,281.73
Laid in cost	12,043.73
Labor and superintendence erecting supports, bins, etc.	5,067.41
Materials, lumber	3,732.12
Materials, miscellaneous	209.62
Supplies and miscellaneous	1,072.59
Labor, installing machinery, etc.	1,878.20
Overhead charges	2,369.09
Total for conveyor "A"	26,372.76

Item	Cost	Unit Cost per Cu.Yd. of Earth
Labor—Conveyor operation	$9,857.27	$0.0161
Supplies—Miscellaneous	718.96	0.0012
Power plant operation	3,200.54	0.0052
Repair plant operation	1,269.87	0.0021
*Depreciation	23,062.88	0.0376
Total	$38,109.52	$0.0622

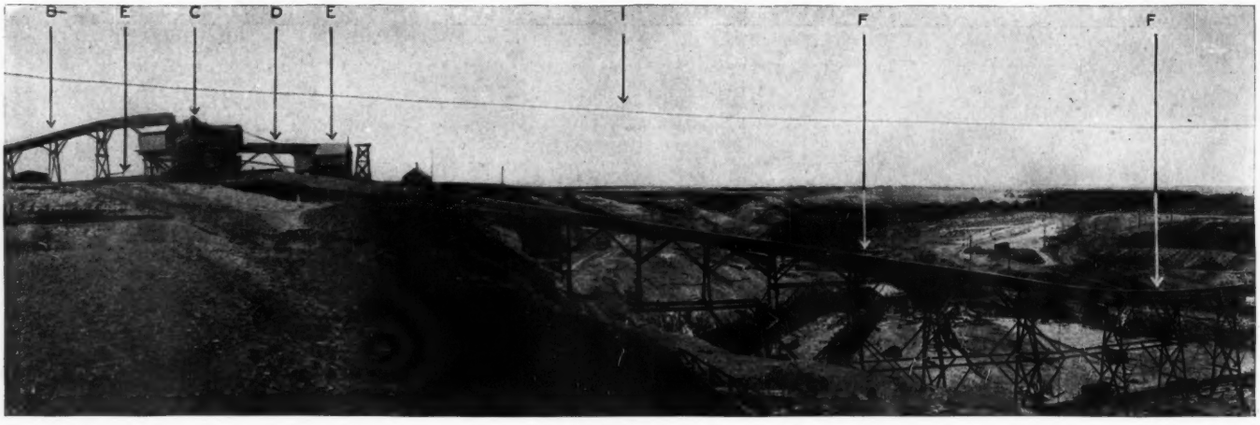
**It will be noticed that on account of the temporary nature of the installation the unit costs have had to bear a depreciation charge very nearly equal to the original cost of the conveyor installed.*

The main conveyor was driven by a 100-horsepower motor installed mid-way of its length. The feeders and cross conveyor were driven by a twenty-horsepower motor. Electric currrent was generated at the site of the work by utilizing the drop of the main canal and the total cost of production was about 1 cent per kilowatt hour.

Common labor was paid 30 cents per hour and mechanics ranged from $3.00 to $5.00 per day. Work was carried on in one eight-hour shift daily extending over two years with intermissions of a few weeks during the coldest weather.

The conclusion is that the work was done at least as cheaply and probably at less cost than with the borrow pit tracks extending out over the dam on high trestles. Certainly the regularity and uniformity of distributing the material, together with the perfection of mixing the materials in the desired proportions, were far better achieved than would have been possible by dumping cars from any considerable elevation. The reliability and freedom from all mishaps with the belt conveyor were most satisfactory. The capacity was abundant and the output was limited only by the ability of the borrow pit crew to feed the belt at one end and the ability of the distribution force to place the material in the dam at the other end. Sometimes one and sometimes the other of these considerations governed the rate of progress which was never limited by the conveyor.

The "S-A" Engineering Corps is prepared to carefully study your particular requirements, cooperate with your own engineers, and then recommend the right equipment without obligation on your part. Consult us now—write today. Send for your copy of "S-A Labor Saver" our magazine—free.



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Engineering and Mining Journal

VOLUME 102 DECEMBER 2, 1916 NUMBER 23

A Sedimentary Magnesite Deposit

By Leroy A. Palmer*

SYNOPSIS—Deposit operated by Rex Plaster Co., near Bissell, Calif., is the only one in United States of known sedimentary origin. It is worked by opencut and by underground stoping, principally by undercutting with picks, very little powder being used. In surface work, including stripping, 25 men and 12 teams produce daily 45 tons of shipping product with less than 14% of silica and lime. Product is graded according to impurities and shipped to Los Angeles for calcining.

The only commercial magnesite deposit of sedimentary origin, known to exist in the United States, is situated 1 mi. north of Bissell, Calif.,[1] a small station 11 mi. east of Mojave on the main line of the Atchison, Topeka & Santa Fe R.R. It is operated by the Rex Plaster Co., of Los Angeles, Calif. All other deposits of this mineral which have heretofore been exploited to any extent are such as have been formed by the alteration of igneous rocks of high magnesia content, such as the olivines or pyroxenes, by which alteration magnesite, serpentine or some allied rock is usually produced.

The Bissell deposit consists of a series of interstratified beds showing magnesite, clay, sandstone and chert, all more or less magnesian in character and presumably of the same series as certain massive limestones which outcrop near-by. One measured section of 87 in. shows 13 distinct beds, six of which are magnesite varying from 3 to 18 in. in thickness.

The origin of the deposit is not fully understood. In his report on it Hoyt S. Gale[2] advances the theory that this region was once a lake basin containing waters high in sodium carbonate. Springs and streams containing magnesium sulphate in solution drained into the lake, resulting in a reaction by which magnesium carbonate and sodium sulphate were formed and the magnesium carbonate precipitated.

Following the deposition and faulting of the various strata of the magnesite series, the deposit was overlaid unconformably by a more recent deposit of a few feet of sand and gravel, forming the slight "overburden" shown in the illustrations. Subsequent to the formation of the sedimentary beds, they were faulted by a heavy overthrust of almost due east-west strike. This overthrust resulted in highly folding and distorting the beds and was accompanied by many minor reverse faults with throws from a few inches to three or four feet. Along the fault-plane the dips are opposed and vary greatly, ranging from 25 to 45°; but from present developments it would appear that they are much flattened at a distance from it. The faulting was also accompanied by lateral flexure.

The faulting brought some of the magnesite strata to the surface, and the deposit has been developed along the fault-plane by an opencut 1,000 ft. or more in length with a maximum depth of 30 ft.

Horizontal and distorted beds — Anticline on fault line

VIEWS OF SEDIMENTARY MAGNESITE BEDS NEAR BISSELL, CALIF.

*Mining engineer, 512 Custom House, San Francisco, Calif.

[1]Located in Kern County, in T. 10 N, R. 11 W., San Bernardino Meridian and Base-Line.

[2]United States Geological Survey, Bulletin 540.

In the 87-in. section referred to, there is a total thickness of 55 in. of magnesite, but this is exceptional. Taking the deposit as a whole and allowing for the overburden, there is a proportion of six or seven parts of waste to one of ore. Most of the ore so far extracted has been from the cut in which the magnesite seams vary in thickness from 2 to 18 in., the average being from 3 to 5 in. The overburden has a maximum thickness of 6 ft. and is loosened by plows and removed by scrapers, leaving the magnesite and associated strata exposed. By these means 14 to 25 cu.yd. of overburden is removed by each team per day, the amount varying according to the length of the haul to the dump.

With the overburden stripped, the deposit is opened by benches; working both ways from the fault-plane on the opposed dips. The height of the benches is varied from 10 to 20 ft., as convenient, and they are carried back about 15 ft. horizontally. Powder is used very sparingly, and waste must be handled with care to insure a clean shipping product. As stated, dips in the cut vary from 25 to 45°., and the amount mined per man will vary with the dip. On the steeper slopes, where the rock slides easily, one man can bring down as much as 25 or 30 tons of ore and waste per day. The proportion of this that can be accounted for as ore will of course vary with the composition of the section being mined. Including stripping, mining and cleaning the magnesite on both sides, 25 men and 12 teams produce 45 tons of shipping product per day; so that, considering the thin seams, the frequent flat dips, the careful breaking and handling necessary, the method is not so expensive as it might seem.

In order to reach those seams lying too deep for opencut work a 4x4-ft. shaft (with a gasoline hoist) has been sunk to a depth of 100 ft., at which point it meets an incline 185 ft. long with an average pitch of 23°. About 550 ft. of drifting and crosscutting has been done from the shaft, and

SEDIMENTARY MAGNESITE DEPOSIT OPERATED BY REX PLASTER CO. NEAR BISSELL, KERN COUNTY, CALIF.

as it is desirable to avoid the mixing of waste and ore as much as possible. The work is carried on by undercutting, somewhat on the order of coal mining, which can be accomplished in the softer strata by the use of a pick alone. The cut is carried under the waste until a seam of good magnesite is reached. The waste above the undercut is then broken by working upward and picking as much as possible, pulled down and wheeled out of the way, leaving the seam of magnesite exposed.

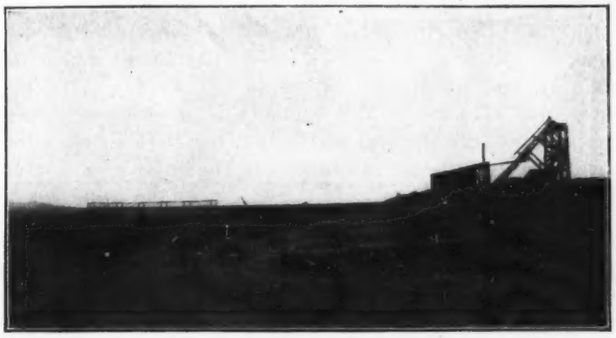
The magnesite is usually found covered by a seam of magnesian clay, thin but such as materially to detract from its quality. This is scraped off by hand, a broad-pointed pick resembling a small adze being used for the purpose. The magnesite seam is then undercut, picked down and the underside cleaned of clay; after which it is ready for shipment.

This would perhaps appear to be a crude and expensive system of mining, but is necessary; as both overburden at one point a stope of considerable size was opened, by square-setting, where there were several thick seams close together. It was decided, however, that any method involving the permanent use of timber was too expensive for this deposit, and a modified room-and-pillar system is being installed. The method to be followed is to put up cribbed raises from the main drift and open rooms along the seams, both to the rise and to the dip. All rock, both ore and waste, will be brought down by stripping overhead. The rooms are to be supported by light timbering, consisting of posts and headboards, and will be packed with waste. Surplus waste and ore will be dropped down the raises and hoisted.

The system tentatively adopted is to drive rooms 30 ft. wide with pillars of 8 to 10 ft. The timbers used will be recovered, but it does not appear that any means can be devised for robbing the pillars. If the magnesite seams were thicker, so that the ore could be quickly removed, this

might be accomplished and the roof allowed to cave; but with the small proportion of ore that can be recovered and the weak nature of the accompanying strata, it is probable that from the standpoint of safety and economy it will be advisable to lose the pillars.

The product of the mine is shipped to Los Angeles for calcining. It is graded according to the impurities



SHAFT AND ORE BIN OF REX PLASTER CO. MAGNESITE MINE NEAR BISSELL, CALIF.

present, of which lime and silica are the most important. The lowest commercial grade acceptable must contain not more than 11% SiO_2 and not more than 3% CaO, after calcination.

Acknowledgment is due P. A. Wickham, superintendent, for assistance in gathering these data.

Chile Copper Tax

A project has recently been presented to the Chilean Congress by Señores Arturo Prat and Guillermo Subercaseaux for the taxing of copper bars and copper minerals exported from Chile, according to the *West Coast Leader,* Sept. 14, 1916. At present this metal pays no duty.

The projected decree states that copper bars and copper ores will pay an export tax of 1½% ad valorem, when the price of copper in London or New York fluctuates between £60 and £65 per metric ton. When the price fluctuates between £65 and £80, it will pay the beforementioned duty plus 10% on the difference between £65 and the total value. When the price fluctuates between £80 and £100, it will pay the taxes mentioned plus 15% on the difference between £80 and the total value. When the value exceeds £100 per metric ton a tax of 20% will be imposed on the amount above the £100. This apparently means that copper, say, at £110 per ton would pay 1½% on the first £65, 10% on the next £15, 15% on the next £20 and 20% on the remaining £10.

Article 2 states that for determining the value of the bars and ores, the president of the republic will fix a tariff in accordance with the scale used in commerce for the sale and purchase of the same products.

Borates, either in a raw state or calcined, are to pay a fiscal tax of one peso gold of 18d. per 100 kg. (220.46 lb.) At the end of two years counting from the promulgation of this law, they are to pay 15 pesos gold of 18d. per metric ton.

Article 4 states that exporters of minerals will be obliged to declare the average grade of their shipments, producing the assay certificates if they are the producers, or the bills of sale if they are the buyers.

In case of doubt as to the grade, the custom house authorities can order a new assay. In case of a false declaration of assay, the exporter will be subject to a fine of 10% of the duty, which corresponds to the duty of the copper in bars.

Testing Refractory Firebrick*

Tests should be made on bricks taken at random and not on specially prepared test pieces. They must be conducted at temperatures bearing some relationship to those in commercial furnaces; for example, the upper part of a blast furnace is about 260° C., while 1,350° C. is above the melting point of cast iron and is in other ways a suitable temperature at which to make tests. The following tests have been developed mainly with reference to bricks to be used in iron and steel plants, but may be modified so as to be applicable to almost any conditions of service:

Impact, Abrasion and Spalling Tests

Before making the impact test, the brick is heated to 260° C. in one hour and kept at that temperature for three hours. A steel ball of 2½ in. diameter, weighing 2.34 lb., is dropped on the end of the brick from a height of 2 in., by 4 in., and so on, until the brick shows a fracture radiating one inch or more from the point of contact. The ball falls between two vertical and parallel angle irons, so that it may travel freely with not more than ¼ in. clearance. The ends of the bricks are ground parallel and at right angles to the angle irons. The brick is supported on a steel block 6½x15x12 in.

To make the abrasion test, the brick is heated slowly to 1,350° C., and kept at that temperature for three hours. One end is then pressed under a constant pressure of 10 lb. per sq.in. for exactly five minutes against a vertical carborundum wheel of 18 in. diameter with 2-in. face, grit 16, grade J, revolving at a surface speed of 1,640 ft. per min. The depth of the cut is regarded as a measure of the abrasion. Some bricks give different results when both ends are tested.

To make the spalling test, the brick is dried thoroughly, weighed and placed in the doorway or wall of a furnace so that one end is exposed for one hour to a temperature of 1,350° C., this end being flush with the wall. The brick is then plunged to a depth of 4 in. in two gallons of water for three minutes. After heating and cooling in this way ten times, the bricks are dried at 100° C. for at least five hours, all particles that can be easily broken off with the fingers are removed, and the bricks are reweighed. The percentage loss in the weight of the brick is regarded as a measure of the spalling. This test is applicable only to fireclay bricks.

Slagging, Compression and Gravity Test

In making the slagging test, the use of kaolin rings to confine the slag was unsatisfactory, and it was found necessary to drill a circular cavity of 2½ in. diameter and ½ in. deep at the sides, in the brick, the cutting edges of the drill inclosing an angle of 150°. The brick is heated to 1,350° C., 35 grams of slag ground to pass a 40-mesh sieve is placed in the cavity, and the

*Excerpts from a paper by C. E. Nesbit and M. L. Bell, presented to the American Society for Testing Materials, June, 1916.

heating is continued for two hours. The brick is allowed to cool and is then sawn through the center of the drilled cavity by means of a carborundum wheel ⅛ in. thick, grit 16. The area penetrated by the slag is measured with a planimeter.

For making the compression test, the brick is heated slowly at 1,350° C., and is then maintained at that temperature for three hours; it is removed from the furnace, and a 2½-in. steel ball forced into it by means of a weighted lever of the second order consisting of a 4-in. I-beam 10 ft. long. The brick is placed 6 in. from the fulcrum, and a spherical depression in the beam marks the location of the ball. The lever alone applies a pressure of 850 lb. on the ball, and sand is run into a bucket at the end of the lever at the rate of 25 lb. per second so as to produce a total load of 1,600 lb. on the ball. After five minutes the pressure is released, the brick removed and allowed to cool. The depth of the impression is measured with a micrometer gage when the brick is cold.

Apparent specific gravity is determined by weighing and measuring the brick, and not by suspension in water. It depends partly on the percentage of moisture in the material used for making the bricks, and on the pressure employed in shaping them. Power-pressing up to 1,500 lb. per sq-in. improves the quality of fireclay bricks.

Expansion, contraction and fusibility are determined by the usual methods.

Tungsten Ore in Peru

A recent consular report from Peru says that the high prices prevailing have caused much interest in the working of properties containing ores of tungsten and other rare metals. Prior to 1910 no tungsten was exported from Peru. In that year 12 tons was shipped. The demand has rapidly grown until at present there are shipments of about 345 tons a year, mostly to the United States and England. During the first three months of 1916 about 70 tons of concentrates, running from 58 to 56% WO_3, was exported from the consular district of Salaverry, and it is not improbable should the demand continue and high prices prevail, that this quantity will be increased.

Tungsten was first discovered associated with gold in a mine in Lircay, Ayacucho, and later on in considerable quantities in the mountain region of Pelagatos, in the province of Santiago de Chuco, where there exist today three or four valuable mines. The mineral found in Lircay is tungstate of iron and manganese, and that found in the north is principally hubnerite (tungstate of manganese). The rapid increase in the utilization of this mineral in the manufacture of war material and tools has given it an enormous value at the present time. The production for 1916, should the war continue, will probably be at least 50% higher than for the preceding year. The French government is at present manifesting interest in these mines. Recently Colonel Dogny, of the French Army, visited the tungsten-producing regions of Peru in the interest of the factories of Creusot, belonging to Schneider & Co., France. In December, 1915, there were rumors to the effect that large deposits of tungsten were discovered in the Puno region, and samples submitted to the engineers at Lima proved it to be wolframite of good quality. Nearly all the tungsten exported at the present time is shipped to the United States.

The three principal mines are owned by Peruvians who have at present a contract for a few months with a German house of Lima, which firm ships this ore largely to a banking firm of New York.

The Mineral Production of Spain for 1915

In *Revista Minera* of Sept. 24, 1916, the *Consejo de Mineria* (Department of Mines) is congratulated for making public at an early date the statistical report on mining and metallurgy of Spain for 1915. With the exception of some of the nonmetallic products of lesser importance, the mineral production for 1915 is tabulated here, the items being rearranged in the order of the value of the total output of each substance, at the mine where produced.

Substance	Metric Tons
Bituminous coal	4,135,919.000
Lead (ore)	285,265.796
Iron (ore)	5,617,839.000
Iron pyrite (cupriferous)	1,464,349.716
Iron pyrite	730,568.000
Zinc (ore)	81,921.851
Anthracite coal	222,621.000
Mercury (presumably ore)	20,717.000
Lignite	328,213.000
Copper (ore)	23,067.871
Salt	305,035.000
Manganese (ore)	14,328.000
Tungsten (presumably concentrates)	511.300
Argentiferous lead (presumably ore)	2,934.639
Sulphur (presumably crude rock)	28,937.000
Copper pyrites	2,001.430
Tin (presumably concentrates)	102.400
Silver (presumably selected ore)	210.398
Barytes	4,218.000
Asphalt	4,521.000
Antimony (presumably ore)	300.000
Bismuth (presumably concentrates)	16.805
Kaolin	4,700.000
Wulfenite (presumably concentrates)	26.000
Fluorspar	370.000
Asbestos	39.000
Magnesite	1,400.000
Graphite	30.000

John Fritz Medal Presentation

The John Fritz Medal, awarded to Dr. Elihu Thomson in January, 1916, will be presented at a meeting to be held in Boston, Dec. 8, 1916. The presentation will take place in the Central Lecture Hall of the new buildings of the Massachusetts Institute of Technology. The members of the four national engineering societies and others interested, including ladies, are invited to be present.

The John Fritz Medal is awarded from time to time for notable scientific or industrial achievement and was provided for in a fund subscribed in memory of the great engineering pioneer, John Fritz. The award is made by a permanent board composed of four members from each of the four national engineering societies. Dr. Thomson was awarded the medal "for achievements in electrical inventions, in electrical engineering, in industrial development and in scientific research."

Diatomaceous Earth, which is made up of remains of minute aquatic plants, is a light earthy material resembling chalk or clay. The hardness, the minute size and the angular shape of its grains make it an excellent metal-polishing agent, and heretofore it has been largely used as an abrasive in the form of polishing powders and scouring soaps. Of late, however, according to the United States Geological Survey, the uses of diatomaceous earth have been considerably extended. It is used by sugar refiners for filtering or clarifying; as an insulating packing material for safes, steam pipes and boilers; and as a fireproof building material. In the United States it is used in the manufacture of records for talking machines. In Europe it has been used in preparing artificial fertilizers and in the manufacture of water glass, cements, artificial stone, paper, sealing wax, fireworks, papier-mâché and other articles. A total of 4,593 tons of diatomaceous earth was produced and sold in the United States in 1915.

The Valuation of Bedded Mineral Land

By F. A. Guignon*

SYNOPSIS—Formulas and examples are given for the valuation of bedded mineral deposits, based on one of four possible conditions; (a) where mineral is being used; (b) mineral not to be used for a year; (c) mineral being used and land has surface value; (d) mineral not being used, land having surface value.

The value of a mineral deposit is usually determined more or less by the law of supply and demand or by the judgment of one or more parties. At times when a company has needed a particular piece of land to keep its business in operation, the seller has demanded a price that was limited only by his judgment of the willingness and ability of the company to pay it. The object of this article is to furnish the operators of any mineral deposit a basis on which to figure the value of the deposit when buying or selling or when figuring the value of their own holdings for accounting purposes.

There are four basic conditions affecting the value of land containing a mineral deposit, each one being represented by an algebraic formula. When the mineral is being used, the following formula is applicable:

$$A = \frac{2BCD}{2 + E + EF} \qquad (1)$$

When the mineral is not being used and its use will not begin this year, use the following formula:

$$G = \frac{2BCD}{(1 + EH)(2 + E + EF)} \qquad (2)$$

When the mineral is being used and the surface land has a value for farming or other purpose, use the following formula for the surface-land value:

$$J = \frac{(BKE)(F + 1)}{2 + E + EF} \qquad (3)$$

When the mineral is not being used and its use will not begin this year, and when the surface land has a value for farming or other purpose, use the following formula for the surface-land value:

$$L = \frac{(BKE)(F + 1)}{(2 + E + EF)(1 + EH)} + \frac{BKEH}{1 + EH} \qquad (4)$$

Evidently when it is desired to find the total value of the land which has a surface value and contains the mineral deposit, we must add together A and G or J and L, as the case may be.

In all these formulas,

A = Present value of the mineral deposit if now being used or if its use will be started in the present year;

B = Number of acres underlaid with the mineral;

C = Average tonnage per acre estimated from the average depth of the deposit;

D = The advantageous price per ton (this is the price per ton that the mineral is worth and must be figured as a decimal of a dollar);

E = Interest due on invested capital (when this is 6% it must be entered as 0.06);

F = Number of years the deposit will last if used at a uniform rate, which is usually estimated.

G = Present value of the deposit if it is not being used and if its use will not be started in the present year;

H = Number of years it is thought the deposit will lie idle or the number of years that will elapse before the continuous operation of mining the mineral will be started (when the term represented by H is concluded, the term represented by F begins);

J = Surface-land value when used for farming or other purpose on a piece of land containing a mineral deposit that is being used or will be used this year (J represents the surface-land value when A represents the value of the mineral deposit);

K = Surface-land value per acre for farming or other purpose if undisturbed by mining operations;

L = Surface-land value when used for farming or other purpose on a piece of land which contains a mineral deposit that is not being mined and that will not be mined this year (L represents the surface-land value when G represents the value of the mineral deposit).

Formulas (1) and (2) are based on the fact that if every year there should be deposited in a sinking fund an amount equal to the value of D in each instance multiplied by the tonnage taken out, the sinking fund at the end of the term represented by F would be large enough to repay the total value represented by the formulas and interest on the value of the mineral remaining unused each year.

Formulas (3) and (4) are based on the same principle except that the amount supposed to be deposited in the sinking fund would be equal to the value of E multiplied by the value of the surface land undisturbed by the mining operations each year. The value per acre of the land undisturbed is to be found by dividing the original value as found by the formulas by the original number of acres.

The Determination of "D"

The surface-land values as found by these formulas are based on the assumption that when the mineral is mined, the surface land will be rendered unfit for any further use. In the very few cases where the surface would not be disturbed or where the land would be of any later use, these values will not govern. These isolated cases can be covered by adding to the present value of the land as determined by ordinary methods, the value of the mineral deposit as determined by formulas (1) and (2).

We must be very careful in figuring the value of D in our formulas. An operator can determine his value of D by answering the question, "How much more per ton can I afford to pay for this piece of land containing a mineral deposit than for another?"

*Terra Cotta Tile Co., Ottawa, Ill.

All natural but very few artificial conditions have an effect on the value of *D*. Of course, marketing price, depth of vein, the amount of dead material that must be handled, the depth of stripping, drainage, propping and the height or distance of haulage must all be taken into consideration. In the case of ores the percentage of mineral content will have a bearing on the value of *D*.

Under only a few conditions should any mining, hoisting, screening, handling or loading machinery or equipment be taken into account. Equipment of this kind saves money for the operator, but this saving is a credit on the value of the equipment and shows good business judgment on the part of the operator. It does not in any way affect the value of the mineral deposit in the ground. Of course if the machinery equipment is owned by the same firm or individual as the deposit itself and the entire land and equipment is leased, the equipment has some effect on the value of the deposit from the standpoint of the lessee.

If a competitor is mining a mineral with poor equipment, it would seem that the value of *D* ought to be figured at the difference in the cost of operation of the two mines. This is not true. The value of *D* is really the advantage in the cost of operation which one mine enjoys over another if their equipment is equal or the advantage which it would enjoy if their equipment were equal.

Possibly Jones has a mine with modern equipment and can get his mineral out for five cents per ton less than Smith, who has poor equipment. If Smith were to put in modern equipment, he would be able to get his mineral out for the same amount as Jones. Evidently the value of *D* for the mine operated by Jones is not five cents. His difference in cost of operation is a credit to his equipment and has no effect on the value of the mineral deposit.

A deposit enjoying good conditions that are hard to duplicate or one producing a large percentage of pure mineral from the ore taken out will have a higher value for *D* than one not enjoying these good conditions. For any mine that is in operation we would suggest a minimum value for *D* equal to 1% of the selling price of the mineral. Even though the cost of operation is greater than that of a competitive mine, the assurance and satisfaction of working a vein of ore or mineral so as to show at least some profit is worth that much.

Many land owners will find by these formulas that their supposedly valuable vein of mineral is practically worthless, because the high cost of operation will not justify a value greater than zero for *D*.

If a firm has an old lease on a royalty of 2½c. a ton and since that lease was signed the price on surrounding land has increased to 5c. per ton, the value of *D* for the lessee is 2½c. provided other conditions are equal. The owner of a piece of land containing a mineral deposit which he has leased will figure his royalty price as the value of *D* for his holdings.

Using formula (1), suppose a mine operator owns 50 acres of land and that the mineral averages 6 ft. in thickness. Minerals vary a great deal in weight, but for our purpose we will use 200 lb. per cu.ft. An acre contains 43,560 sq.ft. We have therefore 26,136 tons per acre. We will suppose that this will all be mined. In case some must be left for pillars, the operator would have to deduct an estimated amount from this item. Suppose *D* equals 5c. per ton. In the case of an ore *D* would be worth more. Suppose that the capacity of the mine has been 100 tons per day for 300 days in the year. This will make an average yearly output of 30,000 tons. The mineral will then last 43.6 yr. This will be the value of *F*. We will figure *E* as 6%. Therefore

$$A = \frac{2 \times 50 \times 26{,}136 \times 0.05}{2 + 0.06 + (0.06 \times 43.6)} = \frac{130{,}680}{4.676} = \$27{,}946.96$$

$$= \$558.94 \textit{ per acre}$$

Suppose that adjoining this tract of 50 acres there is another piece of 25 acres of identical mineral. What can the operator afford to pay for this piece? Assume that the same output will be maintained and the second piece will not be used at all until the first is all mined. We will use formula (2), and *H* will equal 43.6

$$G = \frac{2 \times 25 \times 26{,}136 \times 0.05}{[1 + (0.06 \times 43.6)][2 + 0.06 + (0.06 \times 21.8)]}$$

$$= \frac{65{,}340}{3.616 \times 3.368} = \frac{65{,}340}{12.178688} = \$5{,}365.11,$$

or \$214.60 *per acre*

Suppose that the operator buys this second piece for \$5,365.11. Evidently his total mineral value would be \$27,946.96 + \$5,365.11 or \$33,312.07. This equals \$444.16 per acre.

To check our figures suppose we consider the 75 acres as belonging to one piece. We will then use formula (1):

$$A = \frac{2 \times 75 \times 26{,}136 \times 0.05}{2 + 0.06 + (0.06 \times 65.4)} = \frac{196{,}020}{5.984}$$

$$= \$32{,}757.35, \textit{ or } \$436.76 \textit{ per acre}$$

A discrepancy appears due to figuring the interest involved, but as it amounts to only \$7.40 per acre, or a little more than 1.5%, we can be satisfied.

A Deposit Having Surface and Mineral Value

Formulas (1) and (2) can be used just the same for leased land as for land that is owned outright. In the case of leased land the lessor can use the price per ton which he receives as his value of *D* and the lessee can figure his value of *D* according to conditions. If the royalty is lower than an adjoining piece, the lessee can figure accordingly. Naturally, the lessor's value of *D* and the lessee's value of *D* when added together ought to give the value of *D* that would be used if the owner of the land were also the operator.

We must still consider the surface-land value. Take the 50 acres that we figured on. There is one new value to determine; namely, *K*. Suppose it equals \$100. Then formula (3) will be

$$J = \frac{(50 \times 100 \times 0.06)(43.6 + 1)}{2 + 0.06 \times (0.06 \times 43.6)} = \frac{13{,}380}{4.676}$$

$$= \$2{,}861.42, \textit{ or } \$57.26 \textit{ per acre}$$

Take the second piece of 25 acres, from which the mineral will not be mined until all the mineral is taken out of the first 50 acres. We will use formula (4):

$$L = \frac{(25 \times 100 \times 0.06)(21.8 + 1)}{[2 + 0.06 + (0.06 \times 21.8)][1 + (0.06 \times 43.6)]}$$

$$+ \frac{25 \times 100 \times 0.06 \times 43.6}{1 + (0.06 \times 43.6)} = \frac{150 \times 22.8}{3.368 \times 3.616} + \frac{6{,}540}{3.616}$$

$$= \frac{3{,}420}{12.178688} + 1{,}808.63 = \$280.82 + 1{,}808.63$$

$$= \$2{,}089.45, \textit{ or } \$83.58 \textit{ per acre}$$

Adding together the two results, the total value of the surface land of the two pieces is found to be $2,861.42 + $2,089.45 = $4,950.87. This equals $66.01 per acre.

Again, to check our formulas suppose that after the operator has bought the second piece of land, we figure the total combined value on the basis of formula (3),

$$J = \frac{(75 \times 100 \times 0.06)(65.4 + 1)}{2 + 0.06 + (0.06 \times 65.4)} = \frac{29,880}{5.984}$$

$$= \$4,993.32, \textit{ or } \$66.58 \textit{ per acre}$$

A discrepancy of $0.57 per acre appears the same as when combining formulas (1) and (2). As it amounts to less than 1%, we can disregard it.

To show how our formulas will work out, take the first case, where it was found that A for a certain piece of 50 acres containing a mineral deposit equaled $27,946.96. Each yearly depreciation will be $640.99. The interest on invested capital the first year will be $1,676.82. On account of the depreciation the interest the second year will be $1,638.36 and the third year $1.599.90. The interest for the last 0.6 of the year will be $2.30. If we add together all these interest items, we will find the total to be $37,393.04 plus the total depreciation, $27,946.96, and the sum equal to the income necessary to prove our formula, $65,340.

The tonnage per acre (26,136) multiplied by the number of acres (50) multiplied by the value of D (5c.) gives the total income for the entire period. This is $65,430, which is the same total as the interest and depreciation added together.

This proves the statement previously made, that if the yearly income were placed in a sinking fund, at the end of the term, the sinking fund would be large enough to repay the original investment and interest on the capital remaining invested each year. The other formulas can be proved in the same way by actual figures.

The conditions under which mineral land is owned and operated are too varied to enumerate here. We have, however, shown how to determine the various values separately, and each mine operator or owner can combine the values to suit his conditions.

Risk Assumed by Miners

By A. L. H. Street*

Applying the general legal principle that an employee assumes all risks of injury inhering in the nature of work carried on, after the employer has taken all reasonable measures to make the occupation safe, the United States Circuit Court of Appeals for the Ninth Circuit holds in the case of Macaulay vs. Alaska Gastineau Mining Co., 234 Federal Reporter, 611, that a miner engaged in assisting in driving an uplift in a mine, the work being prosecuted in a good and workmanlike manner, assumed the risk of being injured through falling of blasted portions of rock in the process of their removal after blasting.

Aluminum Coins Are to be Used in France for Local Circulation—We have before referred to the replacement of copper coins in Germany by iron pieces. Samuel Montagu & Co. of London say that on the initiative of the Chamber of Commerce of Marseilles, France, aluminum disks bearing the Arms of Marseilles have been authorized recently for local circulation. The issue comprises 75,000 pieces of 10 centimes and 25,000 of 5 centimes.

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California Mineral Production

The total value of 49 metallic and nonmetallic minerals produced in 56 counties in California in 1915 amounted to $96,663,369, as shown by statistical bulletin No. 71, issued by Fletcher Hamilton, state mineralogist, and compiled by Walter W. Bradley, mining statistician of the State Mining Bureau. This is an increase of $3,348,596 over the total in 1914, despite a decrease in petroleum of $3,983,272 and decreases in some other minerals. Copper increased $3,114,192; gold, $1,788,800; zinc, $1,597,002; tungsten, $824,892; quicksilver, $599,603. There were increases also in the value of antimony, chrome, lead, manganese, platinum, silver, borax, potash and magnesite. There was a decrease in the total value of both structural and industrial materials, though increases are shown in several of the minerals in these two groups.

Antimony ore amounting to 510 tons valued at $35,666 was produced in 1915, the first production since 1901. In 11 years beginning with 1887 the records show a total yield of 680 tons valued at $79,805. Borax, chrome and magnesite are produced in no other states. The total of saline products, including borax, nitrates, potash, salt and soda, decreased from $2,182,909 in 1914 to $2,135,134 in 1915, but there was an increase in the production of borax from $1,483,500 to $1,663,521 and in potash from $460 to $19,391. The production of potash in 1915 amounted to 1,076 tons, being in part extraction from kelp and part from dust collected in cement mills by the Cottrell process. The plant under construction by the American Trona Corporation, at Searles Lake, was not completed until October, 1916. Experiments were in progress in 1915-16 in the extraction of potash from the bitterns of Owens Lake. The prospects for large production of potash from these two saline bodies in 1916 are encouraging. Chrome and magnesite increased in both amount and value. Chrome was produced principally in Fresno, Shasta and Tuolumne Counties, the total amounting to 3,725 tons valued at $38,044, being more than twice the tonnage and four times the value of the product in 1914. Magnesite increased from 11,438 tons, valued at $114,380 to 30,721 tons valued at $283,401. The product is credited to Tulare, Santa Clara, Sonoma, Napa, Fresno and Kern Counties.

Copper, silver, lead, quicksilver, zinc and tungsten were particularly affected by the European War, showing in each metal except lead a large increase in amount as well as in value. Copper was, as usual, produced chiefly in Shasta County, credited with 30,828,917 lb. Calaveras produced 4,031,149; Plumas, 3,164,496; San Bernardino, 209,440; Inyo, 154,722 lb. Fifteen other counties produced varying amounts under 100,000 lb. The total for the state was 40,968,966 lb., valued at $7,169,567. Silver advanced in price as well as in the number of fine ounces produced, making a total of $851,429, an increase of $37,191 over 1914. Lead production amounted to a total of 4,796,299 lb., valued at $225,426, an increase of only 98,899 lb. in amount, but of $42,288 in value, representing an advance in average price from 3.9c. to 4.7c. Zinc showed the greatest stride in amount and value, the total production being 13,043,411 lb., valued at $1,617,383, an increase over 1914 of 12,643, 770 lb. and $1,597,002. Shasta County is credited with 8,378,401 lb.; Inyo County, 4,625,162; San Bernardino County, 39,848 lb. Silver was produced chiefly in Shasta and Inyo, largely

as a byproduct associated with copper, lead, zinc and gold ores; also produced in 28 other counties. Lead production came chiefly from Inyo County, followed by Shasta, San Bernardino and Kern. Tungsten made the most sensational advance in price and the development of new deposits of any of the minerals affected by the war. Prior to 1915 nearly all the production had come from San Bernardino County, produced by one operator. In the last half of the year production extended to Kern and Nevada Counties. The total value of ore and concentrate shipped increased from $180,575 in 1914 to $1,005,467 in 1915.

Quicksilver production in California amounts to approximately 80% of the total production in the United States. In 1915 the state produced 14,199 flasks valued at $1,157,449, an increase over 1914 of 2,826 flasks and more than a half million dollars in value. The price ranged from $51.90 in January to $123 in December. The average price for the year, based on actual sales reported to the Mining Bureau, was $81.52; the average quotation price was $85.80. The product came from 12 counties. San Benito produced 6,291 flasks; Santa Clara, 4,386; San Luis Obispo, 1,473; Napa, 507; Lake, 492; Sonoma, 159; Kings, Monterey, Santa Barbara, Solano, Stanislaus and Yolo combined produced 891 flasks.

Manganese has been produced in California continuously since 1887 with the exception of 1905, varying in amounts from 1,500 tons to 1 ton. The production in 1914 was 150 tons, valued at $1,500. In 1915 the amount was increased to 4,013 tons, ranging in price from $12 to $18 for low grades and from $50 to $60 for chemical grades. The total value of the product was $49,098. The greater portion of the ore was low-grade, used chiefly in the manufacture of ferro-manganese by electric-furnace reduction; and was produced in Alameda, Glenn, Mendocino, San Bernardino and San Joaquin Counties.

Production of Gold and Platinum

Gold was produced in 30 counties in 1915, a total of $22,442,296. California still maintains the lead of the gold-producing states. The principal counties contributing to the yield of gold are: Amador, $3,894,125; Nevada, $3,446,722; Yuba, $2,703,710; Sacramento, $2,131,813; Shasta, $1,120,848; Tuolumne, $1,058,103 Amador advanced to first place, which was held by Nevada County in 1914. Sacramento and Yuba gold is produced almost wholly from dredge placers.

Platinum yield increased from 330 oz. in 1914 to 667 oz. in 1915. This amount has been exceeded only once in the 28 years recorded by the Mining Bureau; in 1908 the yield was 706 oz. The large output in 1915 was chiefly due to improved methods in dredge mining.

Petroleum and other fuels, including natural gas and coal, combined production, amount to approximately 50% of the total mineral production of the state. Coal is not an important product, but natural gas is coming into prominence, increasing in 1915 over 1914 $657,010, and showing a total of $1,706,480, though this figure is largely estimated. The value of petroleum amounted to a total of $43,503,837, and although this is a decrease of nearly $4,000,000, it is not an indication of diminution in the productive capacity of the fields or decline in price, but is due to the closing of the South American markets, suits by the Federal Government and the elimination of gushers. The decrease in total output amounted to 11,735,287 bbl. The production of commercial petroleum in 1915 reported by 363 producers amounted to 88,240,620 bbl., and 2,906,000 bbl. was consumed in the fields, making a total gross output of 91,146,620 bbl. The average price in all fields in 1915 was 47.9c. per bbl. and 46.1c. in 1914. The highest average price, 85.5c., was paid in Ventura field and the lowest average price, 42.3c. in Kern field. The Ventura price was a decrease from 1914 of 19.5c., and the Kern price was an increase of 1.4c. per bbl. Five large refining and marketing companies produced 33% of the commercial oil; several large concerns, such as the railroads, which are large consumers, produced 16%; the remaining 51% is credited to small producers.

The chapter of the bulletin devoted to production by counties includes all but two of the counties of the state. Alpine contains gold and silver, but no production has been recorded since 1913. Sutter is not a mineral county. The principal mineral-producing counties in the order of value of production and including the predominant minerals in each, are: Kern, $22,335,184, petroleum; Shasta, $8,350,153, copper; Fresno, $8,152,300, petroleum; Orange, $6,617,112, petroleum; Los Angeles, $4,168,612, petroleum; Amador, $4,063,762, gold; Santa Barbara, $3,984,966, petroleum; Nevada, $3,492,946, gold; Yuba, $2,862,430, gold; Inyo, $2,771,042 borax and zinc; San Bernardino, $2,674,042, tungsten and gold; Sacramento, $2,562,281, gold; Calaveras, $2,161,893, gold and copper; Tuolumne, $1,171,438, gold; Butte, $1,622,245, gold. The following counties produced over $1,000,000 each; Santa Cruz, Solano, Riverside, Contra Costa, cement predominating.

The bulletin also contains all the mining laws of the state and maps of counties, singly or in groups. Altogether it is an improvement on the statistical bulletins of former years. The gold, silver and platinum production is taken from the report of Charles G. Yale, statistician of the United States Geological Survey.

Accidents in Cement Plants

The Bureau of Accident Prevention of the Portland Cement Association, Chicago, has issued its report for the year 1915, covering accident and mortality statistics over a period of three years. Substantially the report shows a reduction in loss due to accidents and argues the advantage of accident-statistic work as an aid to accident reduction.

Tabulations show that the commonest causes of accidents and falling objects, flying material and breaking or slipping of machines or parts. Regarded from the standpoint of the process involved, 25% of all the accidents occur in the quarries and the other 75% is distributed throughout the other stages in the process of cement manufacture. In the coal-grinding department the number of accidents is small, but the time lost is high, showing their severity. Recasting of the statistics show that Fridays and Mondays are the worst days for accidents, that 9 to 10 a.m. and 2 to 3 p.m. are the worst hours. Of the injured, 61% spoke good English and only 9% spoke no English.

Magnesite Production in Greece was 117,430 metric tons in 1914, and 133,858 tons in 1915. Exports in 1915 were 92,661 tons raw and 18,726 tons calcined; 111,387 tons in all. Of these exports 33,641 tons raw and 6,318 tons calcined—39,959 tons in all—went to the United States.

What Can Uniform Mining Laws Hope to Accomplish?*

By Van. H. Manning†

SYNOPSIS—A comprehensive statement showing the present lack of uniformity in the mining laws of the United States and of the individual states. The disadvantages of this condition are indicated, and finally a statement is made of the advantage accruing from uniform mining legislation. The proposed code can best be made by coöperation on the part of the Federal Government, state authorities and mining societies.

To make plain the scope of my remarks, I shall define the term "mining legislation." This term I apply to all legislation relating to the acquisition and transfer of mines and mineral lands, to safety and health conditions and to the prevention of waste and the increase of efficiency in the utilization of ores, metals and mineral substances. In thus applying the term, I may seem to broaden my theme unduly, but my reasons for doing so will be evident when the ultimate aim of such legislation is considered. The mining industry is not only burdened with much confusing legislation, municipal, state and national, but it also suffers from a lack of legislation essential to assuring the wise and efficient use of our mineral resources. As an example I may cite the multiplicity of regulations governing the transportation, storage and sale of kerosene and gasoline and the utter lack in many states of effective legislation for preventing enormous waste of petroleum and natural gas. Also, the uncertainties of our Federal mineral-land law and the lack in many states of adequate laws for protecting the safety and health of metal miners are noticeable.

In discussing what may be accomplished by uniform mining legislation, I shall consider the matter with regard, first, to efficiency and, second, to better health and greater safety. Also, I shall give especial attention to the work of the Bureau of Mines, which has "Safety and Efficiency" as its motto, and to the efforts of the Department of the Interior.

Work of the Bureau of Mines

As Director of the Bureau of Mines, Dr. Joseph A. Holmes called attention to the lack of uniformity in the mining laws of the different states and the desirability of uniform legislation. The matter was ever before him in planning the investigations of the bureau, and he constantly sought the coöperation of engineering societies and of other organizations in the endeavor to aid the enactment of better laws. One of the fruits of his efforts was the publication of a proposed code of regulations for metal mines. This code was prepared by a committee of five distinguished mining engineers—John Hays Hammond, W. R. Ingalls, James Douglas, J. Parke Channing and J. R. Finlay—and represented not only the earnest thought of these gentlemen, but the suggestions and criticisms offered by members of the Mining and Metallurgical Society of America, the American Institute of Mining Engineers and other organizations. These rules provide for a thorough system of mine inspection and for safeguarding the miner. Though their chief aim is safety, yet they are intended to contribute to greater efficiency in mining methods.

In efforts to protect miners from the hazard occasioned by oil and gas wells drilled through coal beds, the Bureau of Mines was instrumental in having a conference of coal-mine and oil-well operators and state geologists held in Pittsburgh in February, 1913. At this conference desirable changes in well-drilling practice were discussed, as well as a proposed code setting forth the duties of oil and gas inspectors and the precautions that should be observed in drilling and plugging wells.

Engineers of the bureau, in coöperation with members of the American Society of Electrical Engineers and other interested parties, have recently prepared a draft of a proposed law governing the installation of electrical apparatus in coal mines. It embodies the results of investigations dealing with the use of electricity for light and power, and the establishment of effective safeguards against explosions or fires from sparks, flashes or arcs, and against shock from contact with live wires or with equipment accidentally charged. A set of regulations prepared some years ago by the Bureau of Mines in coöperation with other interested parties was bodily incorporated in the mining code of the State of Pennsylvania.

Revision of Federal Mining-Land Laws

From time to time a demand has been heard for a revision of our Federal mining-land laws that would clarify the vague, conflicting or contradictory provisions of the present code, or for the enactment of a new code that would embody the present needs of the mining industry. This demand has been ably voiced by eminent engineers and members of the bar, who have called attention to the burdens inflicted on innocent persons through the provisions of the law of the apex, and of tunnel-site locations.

The Mining and Metallurgical Society has taken a prominent part in urging the need of a better mining-land code and in enlisting the coöperation of national and state organizations and of Government bureaus. On Dec. 6, 1915, this society called a meeting in Washington, D. C., in which representatives of these organizations, of the National Government and of many operating mines collaborated. The resolutions adopted at that meeting called for a thorough revision of the mining law of the United States so as to coördinate and harmonize its various provisions; recommended the creation by Congress of a Government commission, appointed by the President, to consider and investigate the different questions and issues and to make recommendations in regard to the proposed revision. The Department of the Interior and the Federal Bureau of Mines have favored a revision of the mining-land laws that will eliminate uncertainties, conflicts and contradictions, lessen the chances of litigation over mining titles and thus relieve the industry of unnecessary burdens. The mining code of the Federal Government should exemplify simplicity, clarity and directness.

*Address delivered before the American Mining Congress, Nov. 13, 1916.

†Director, United States Bureau of Mines.

It should serve as a basis for laws governing the acquisition and transfer of mineral lands under state control, and thus should contribute to national efficiency.

The need of wide coöperation in obtaining satisfactory mining laws has been recognized by the Secretary of the Interior, who invited all state mine inspectors and state compensation commissioners to attend a conference in Washington in February, 1916. At this convention one of the principal subjects discussed was the need of uniformity in obtaining and presenting mining statistics. Under present conditions mine operators are asked to report substantially the same information, to four or five different agencies of the state or Federal Government. As a result the compiling of such reports has become a matter that entails considerable work and sometimes the employing of extra assistants. Much of this duplication of reports could be eliminated, thus not only lessening the amount of work involved, but permitting one report to convey all the information desired by the state and Federal officials.

Another important subject discussed was the present lack of a uniform understanding of what constitutes an accident serious enough to come within the requirement of state laws which provide that all serious accidents shall be reported to the mine inspector and shall be included in his annual report. Lack of such a standard definition makes impracticable a fair comparison of the accident risk in one state with that in another, and the need of a uniform method of reporting such accidents was generally recognized.

Classification of mine employees by occupation was another subject that engaged attention. To know the number of men killed or injured in a particular occupation is of little value unless the number of men employed in work of a similar nature is known also. This information is now being reported in some states, and it is hoped that it will extend to all states.

Discussion of present methods of reporting the average number of men employed at mines brought out the fact that there is no uniformity regarding the number of employees in the reports now being submitted by mine operators. Physical difference between one coal field and another make it impracticable to enforce identical regulations in the operation of all mines throughout the country. However, if coal mining can be considered as a whole, we find that even as regards the many features common to all coal mining, there is a lamentable lack of uniformity in state laws.

Probably no one is opposed to mining legislation that shall be as uniform as conditions permit, and the only room for difference of opinion is in regard to conditions that are not alike in different states. The phase of the question should be carefully studied by some representative committee authorized to draft a proposed law covering all phases of the industry that admit of uniform regulation.

A law thus framed would serve as a definite working basis and would be submitted to the mining interests in each state for suggestions. With these suggestions before it, the committee would be in a position to draft a law reasonably satisfactory to all states, and the final draft prepared by the committee might be submitted to the legislature of each state having a mining industry of sufficient magnitude to warrant the enactment of a mining code.

In order to bring about such uniform legislation, the following motion was unanimously adopted: "It is the sense of this meeting that the matter of procuring uniformity of mining laws be referred to the Bureau of Mines, with the request that they do all in their power to bring about that most desirable end." To assist in carrying out the foregoing program and as an aid to a committee that might be appointed to prepare the proposed coal-mine law, a committee was appointed to report on standard forms for reporting mine accidents, mine equipment and other information required by many state mining laws. This committee has had two conferences and is ready to submit its report.

In its efforts to improve health conditions in mining communities, the Bureau of Mines has coöperated with the Public Health Service and the California State Board of Health in general investigations of health conditions and in the study of two diseases, miners' consumption and hookworm. These studies show the prevalence of miners' consumption and pulmonary tuberculosis in certain districts where the mine air contains sharp particles of siliceous dust, and demonstrate that an unsuspectedly large number of men in the Mother Lode gold mines of California are infected with hookworm. They also call attention to the need of adequate preventive measures being adopted not only in the states where the studies were made, but in other states where similar conditions may result in the spread of the two diseases. Other preventable diseases, such as typhoid fever, annually kill or temporarily disable large numbers of persons in the mining industry.

Adoption and enforcement of necessary preventive measures and of strict sanitation may come within the province of officials of mining companies, or of local and state boards of health, but evidently the battle against disease cannot be waged as it should be unless different communities and different states enact laws that will provide for efficient sanitation, the keeping of proper mortality and morbidity records and the quarantine of persons suffering from contagious diseases. The provisions of such legislation and their application should be so uniform that the morbidity figures for certain districts can be compared with those of another, thus permitting the drawing of reliable conclusions as to the relative healthfulness of different methods and practices, the exact determination of what diseases are most likely to affect the mining industry and the special safeguards that may be required.

Ills from Present Lack of Uniform Legislation

In the mines in this country are men from every nation in Europe. Thousands of them had no mining experience before they came to the United States and possessed a merely rudimentary knowledge of English when they began work underground. Moreover, miners in this country are prone to be migratory. For such men the lack of uniform state legislation not only increases the probability of accidents, but also imposes on the mining industry of each state the burden of diminished efficiency resulting from each miner from without that state having to learn the state regulations.

Our coal fields and mineral deposits do not respect state lines, but cross them indiscriminately. Yet one state may have an explicit set of rules governing the operation of mines within its borders, whereas the rules of an ad-

joining state may be indefinite or insufficient, although operators in both fields supply the same market and must necessarily compete with one another. As a result the operators in the state having the less effective laws are enabled to produce coal at less cost and to undersell operators in the other state.

Furthermore, because of these differences in mining codes, the decisions of a state court construing a law in force is usually of slight value outside of the particular state in which the law was enacted. This practically results in each state building up a mining jurisprudence of its own, whereas if such legislation were uniform throughout the states, the opinion of one court could be given weight in passing judgment on like facts before a court in any state. Such a change would ultimately result in eliminating much costly litigation.

Appraising for Taxation

Another matter of importance is the utter lack of any general system of valuing mining properties for purposes of taxation. Municipalities, states and the Federal Government tax mining concerns. What proportion of the total income shall be charged to working account or to depreciation, what allowance shall be made for ore or minerals left underground in the process of mining, what is the value of unmined minerals or of minerals that cannot be worked at a profit?—these are questions to which widely differing answers are given under the present system, or lack of system, in valuing mining properties. The enactment of uniform laws covering these matters would be an inestimable boon to the mining industry.

To lessen if not eradicate occupational disease in the mining industry, uniform legislation is a prime requisite. If one state enacts laws that inconvenience a miner suffering from an infectious disease and a neighboring state has not such laws, the miner has but to cross into the second state to be unmolested. In this way, though the state law may be of great benefit in improving health conditions within the state, it may be the means of spreading infectious disease through other states and thus, in the lack of uniform laws, prove detrimental to the industry as a whole. Of course this result is not to be considered as showing that any one state should not take the initiative in legislation intended to protect the health of miners; it merely emphasizes the need of uniform legislation in these states in which conditions are favorable to the spread of the same disease.

The lack of a uniform system of hoisting signals in the different states is a condition that plainly demands betterment. Many miners move at frequent intervals so that the lack of a uniform signal code decreases the efficiency of mining operations. Also, as mistakes in giving or noting signals may cause horrible accidents, the present lack of uniformity is a constant menace to mine safety.

Present state laws providing for the inspection of mines, quarries, oil and gas wells, mills and metallurgical works show a great lack of harmony, and some even bring about conflicts of authority with the state itself. Considerations of safety, health and efficiency do not receive the attention they demand. Some states have no direct inspection of quarries or metal mines; in other states coal-mine inspection or the inspection of oil and gas wells still leaves much to be desired. Practices that endanger life, impair health, or waste our mineral resources continue unchecked by state authority. Too many state inspectors are not granted sufficient authority or an adequate inspection force to do properly what the law requires them to do. In some states the methods of selecting inspectors do not insure that inspection will be efficient. Mine inspection is a matter that urgently needs improvement in the direction of more adequate service and the harmonizing of state laws relating to the qualifications, duties, powers and authority of inspectors.

In regard to the requirements of mine inspectors there should be uniform methods of inspecting machinery. The public function that can be performed by national engineering societies in procuring such uniformity is already perceived, as is witnessed by the work of the Boiler Code Committee of the American Society of Mechanical Engineers. This society has standardized these features of boiler construction that are essential to safety, and it will probably be only a short time before each and every state accepts this code. Then we shall have uniform measurements for the inspection of boilers.

For the inspection of mine machinery, and especially hoisting machinery, a uniform code of rules is much needed, which legislatures can adopt, based on the best thought of national societies and of Government bureaus. For this reason uniform requirements for the inspection of machinery await merely the taking of suitable action by influential agencies.

The Value of Statistics

Closely connected with topics of uniformity in mining codes and methods of inspection is that of uniformity in accident statistics. It is well understood that even the most earnest endeavors for the protection of life and limb among miners may fail to accomplish the best results if there are no reliable records on which to base regulations. Accident records and statistics show safety conditions, and without satisfactory records this work must necessarily proceed in the dark. The figures published on mine accidents in the United States are as yet hardly more than crude approximations, especially as regards comparisons of accidents in different states.

Still other matters that should receive notice are the methods for determining the injury done by metallurgical smoke, the abatement of such injury, and the disposal of mine wastes, slag and mill tailings in such manner as to avoid damage to property rights.

Under favorable weather conditions smelter smoke laden with injurious fumes and sulphur gases is carried for miles, so that a smeltery situated in one state may cause great damage to vegetation and even be detrimental to animal life in an adjoining state. The state that suffers may have strict laws for abating such injury, but property holders can reach the offending smelter only through protracted and costly effort and the action of the United States Courts.

Similarly, the refuse of mines, mills or smelteries in one state is dumped into a stream to the damage of property farther down and in another state. Clearly, it is not right that property should be impaired or destroyed by the carelessness or wastefulness of persons over whom the laws of the states in which the sufferers reside have no control. The determination of damages and the method of providing for the abatement of the nuisance causing them should be substantially similar in different states, that justice may be done to all.

Uniform state laws are not a new thing in the United States. Almost every state in the Union has at different times appointed commissioners to meet representatives from other states for the purpose of framing laws covering the more general branches of jurisprudence. The most widely known work accomplished by such commissioners is the "Negotiable Instruments Law." This statute was prepared by commissioners on uniform state laws who were appointed by various states to codify and make uniform throughout the United States the law relating to negotiable instruments. For the most part the statute codified existing laws. It has been adopted without important amendment in the District of Columbia and 45 states and territories.

How Uniformity May Be Procured

The "Uniform Sales Act," drafted by a similar commission in 1916, has likewise been enacted in many states to cover the sale of personal property. Clearly, it should be possible for representatives of those most interested in the adoption of uniform mining legislation to get together and through a codification of existing state laws on mining to draft a uniform law and recommend that the various state legislatures enact it. Such a plan was recently proposed, but not carried out, in Oklahoma, with a view to amending the mining laws of that state. Such a plan as this, with all interested parties behind it, would leave the legislature almost no valid reasons for failing to adopt the law.

The uniform negotiable instrument and the uniform sales acts were adopted after members of bar associations—that is, the persons having the greatest interest in the matter—met and drafted the laws, so why should not a proposed uniform mining law be prepared by the parties most interested?

For instance, if representatives of miners' unions, the American Mining Congress, the American Institute of Mining Engineers, the Mining and Metallurgical Society of America, the Mine Inspectors' Institute of the United States and the United States Bureau of Mines were to confer and then recommend to the public a uniform mining law based on a codification of present laws, this proposed law might receive as favorable a reception as did the negotiable instrument act and the sales act.

I do not mean that these representatives should endeavor to actually frame such a law in joint session, as that would be a tedious if not impossible task. The first code of legal ethics adopted in the United States was drafted by one man, Major Thomas Goode Jones, of Montgomery, Ala. The bar association of Alabama recomended by vote the adoption of such a code, but did not undertake to frame a code in open meeting, instead, it designated Major Jones to draft a code as a foundation for discussion, and after such discussion and amendment this code was adopted. When members of the bar and other interested parties decided that the various states would benefit through a uniform law covering negotiable instruments, they, through the commissioners on uniform state laws previously mentioned, designated John J. Crawford, of the New York bar, to draw such an act for discussion, and then the final draft was submitted to the public. Much the same procedure was followed in drafting the Uniform Sales Act. Therefore, if the mining men, operators, miners, inspectors and engineers desire a uniform mining law in the United States, they should follow the methods that have been successful in bringing about the adoption of uniform statutes now existing and appoint a person versed in the mining laws of the various states to draft an act to codify existing legislation.

Such an act would necessarily be elastic and cover the subject only in a general way, as it would be practically impossible to draft an act that would apply to every condition throughout the United States. However, with such a well-considered general act as a basis, it would be a simple matter for state inspectors to issue suitable regulations to cover local conditions. In fact, it is the general rule for the present state laws to cover the industry only in a general way and leave the necessary rules to the discretion of the inspector.

There are many other benefits that can be hoped for as the result of uniform mining legislation, but those pointed out seem the most important. They indicate how wide is the field of endeavor for those who are seeking to obtain such legislation and how great is the need of all interested persons and organizations coöperating for the common good.

Rapid Surveying with a Bicycle

A method for rapidly marking geological and topographical details on maps is described by Leslie H. Ower, in the *Proceedings* of the Australasian Institute of Mining Engineers, Sept. 30, 1916. For the field work he uses a bicycle equipped with a standard make of cyclometer, designed to register distances in miles and tenths of miles. Instead of using but one striker, eight are employed, so that, for each revolution of the bicycle wheel, eight impulses are given to the vanes of the cyclometer. By ignoring the decimal point, the reading is in chains instead of miles. The author has found, by checking distances on existing maps, that with 1½-in. tires the maximum error is 2%, a low reading being obtained when leading the bicycle with tires pumped hard. When riding, the depressing of the tires reduces the radius, with a corresponding reduction of the error.

For field notes an ordinary level book may be used, with the headings shown in the illustration.

HEADINGS FOR FIELD NOTES

Total Distance	Net Distance	Geology	Time	Aneroid Reading	Reduced Level	Remarks

For noting the time a wrist watch is recommended, and for altitude an aneroid barometer, recording differences of 10 ft., to be carried in the right-hand coat pocket. It is found that after a little practice the average time required to record the cyclometer reading, the direction since the last reading, the class of country, the time, the aneroid height, the locality, and to offset by eye any physical feature, is about 50 sec. Readings are taken whenever there is an appreciable change in direction or at other obvious points, according to the nature of the work in progress.

Aluminum Production in Norway is increasing. The plants already in operation and two others nearly completed have a total capacity of 16,000 tons of metal yearly. All of these plants are operated by water power.

Details of Practical Mining

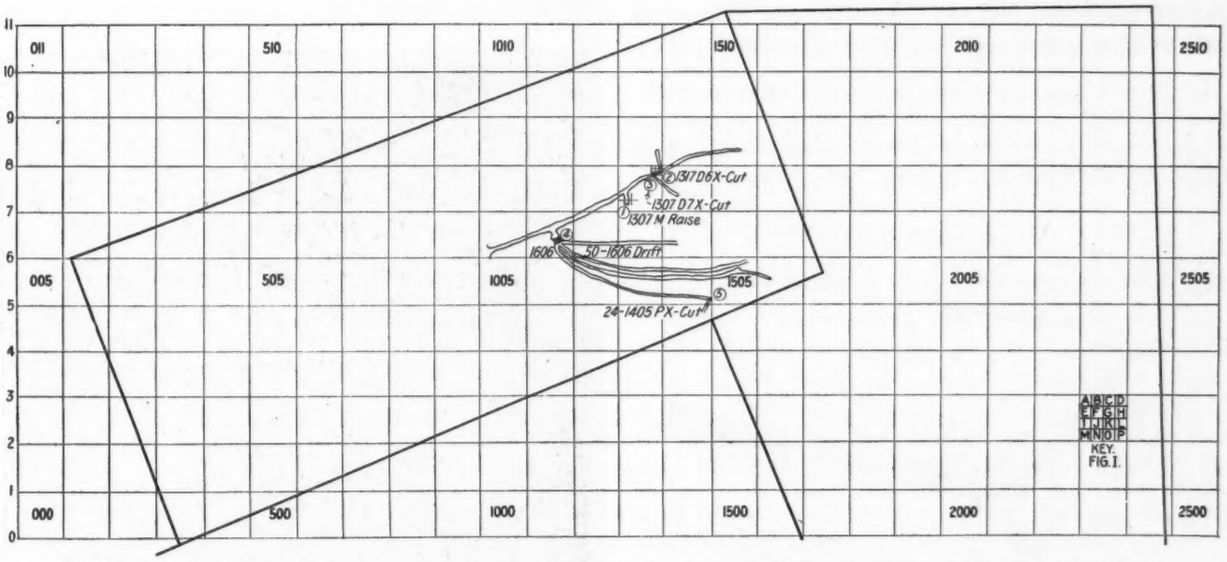
The Scientific Numbering of Mine Workings

By C. Erb Wuensch*

Various methods of naming and numbering mine workings are in use. Some of the systems are logical and serviceable enough for the man at the mine, who is thoroughly familiar with the workings; but for the man in the office or the newcomer at the mine, most numbering schemes fail to suggest the exact, or even approximate, location of a working. A great many appreciate how difficult it is to find a new number on a map or how much more difficult it is to attempt to describe its location.

The system of numbering to be described is based on the three coördinates, *X, Y, Z,* of solid analytical geometry. The origin of the *X* and *Y* coördinates should be so selected that all the property shall lie within the northeast quadrant. The *X* and *Y* coördinates will then always be positive. The origin of the *Z* coördinate should be selected at the uppermost horizon, so that the mine workings will all be below this datum. The *Z* coördinate values should be considered, below the assumed datum, as being positive. By choosing the origin for the coördinates in this manner, we obviate the use of negative coördinates.

The map should be divided into 100-ft. blocks, starting at the origin. Each block will have its *X* and *Y* coordinates. Since it is likely in most properties that the workable area will not cover more than 10,000 ft. to the north and the same distance to the east of the origin (one hundred 100-ft. blocks), we will call each block by its *X* and *Y* in this manner: 2,108 will be a block 2,100 ft. east and 800 ft. north of the origin, the first two digits representing the *X* and the last two digits the *Y* (the *Z* coördinate will be considered later.) Should it be necessary to further subdivide a block, this can be done by dividing the unit 100-ft. block into 16 squares of 25 ft. on a side. Each 25-ft. block can be given a letter, as *A, B, C,* etc. (See illustration.) It will not be necessary to put these letters on the map. A small key to the sub-blocks can be made of a piece of tracing cloth. By superimposing this key over any unit block, we can see at a glance into which sub-block the working we wish to refer to belongs. In rare instances, as in pockety deposits, where several raises or crosscuts may be developed within a 25-ft. block, it may be necessary to further subdivide. This may be done by dividing the 25-ft. block into nine blocks and calling them *A*-1, *A*-2, *A*-3, *B*-1, *B*-2, *B*-3, etc.



PLAN OF A PORTION OF MINE WORKINGS SHOWING THE APPLICATION OF THE SYSTEM OF LOCATION

Thus a raise at one (1) would be 1,307 *M,* the *M* being found by the use of the key. Similarly, if two crosscuts should happen to be driven in 1,307 *D,* one at (2) and the other at (3), the former will be 1,307 *D*-6 crosscut and the latter 1,307 *D*-7 crosscut. The workings are numbered according to the place in which they are begun. Thus far the description has dealt only with workings in one plane. In order to refer to a working on another level, we place the *Z* coördinate before the *X* and *Y*. Thus a drift begun at (4) on a level 500 ft. below the assumed datum would be 50-1,606. An intermediate crosscut 60 ft. above the 300-ft. level as at (5) would be 24-1,405 *P* crosscut. It looks as though it would be very awkward to refer to workings in such a manner. It is true that 20-2,545 crosscut is more awkward to say than 213 crosscut, or whatever number it may be by some other system, but the number 20-2,545 crosscut suggests to the mind the *Z,* 200-ft. level; *X* and *Y,* 2,500 ft. east and 4,500 ft. north of the origin; or a certain distance east

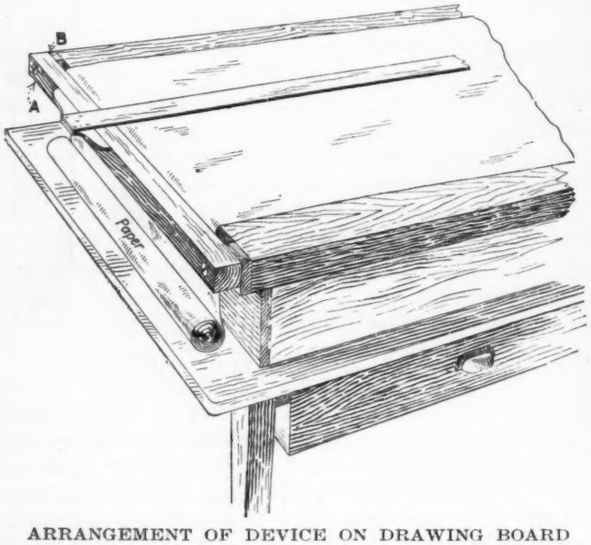
*Mining geologist, Butters Salvador Mines, Ltd., Mineral San Sebastian, Salvador, Central America.

and north of some known working. This enables one to picture in his mind just where he is, which undoubtedly makes it easier to remember the name of the working; since it is axiomatic that things that follow a logical sequence are easier to remember than things devoid of logic. By posting signs underground at all the workings, the workman will learn these apparently more complex numbers just as easily as he would the shorter numbers of some other system. The posted numbers also serve another purpose. They enable the engineer or mine foreman to know, while underground, without the use of maps, approximately his position—a distinct advantage toward efficient development, especially in wet or hot mines where it is difficult to use a map underground. Other favorable features of this method of numbering are its infinite flexibility, its adaptability to the coördinate system of working up survey notes and the manner in which it facilitates the writing and interpreting of mine reports.

It may not be advisable to change a numbering system that has been in use at a mine for some time, but it would undoubtedly be worth while to adopt this method in order to facilitate the writing of weekly and monthly reports.

Arrangement of Drawing Board for Handling Large Drawings

In the making of layouts an occasion often arises where it is desirable to use a sheet of paper which is longer than the board, says a writer in *American Machinist*. This would prove rather an awkward task were the board



ARRANGEMENT OF DEVICE ON DRAWING BOARD

handled in the usual manner, but by arranging the board as shown in the illustration a sheet of flat paper of any length may be used.

The arrangement consists of a strip of wood, or steel, *A* screwed in the edge of the board. The blocks *B* are placed between the strip and the edge so as to leave a space through which the paper may be passed.

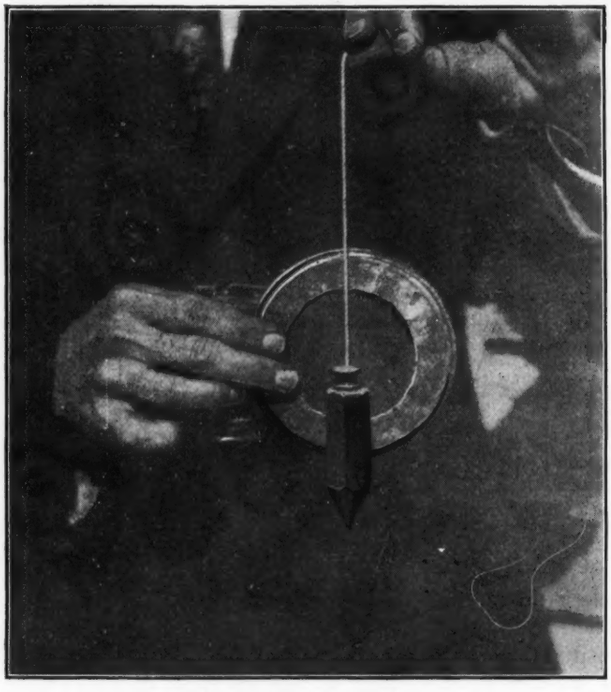
This scheme permits the paper to be run through the slot and over the board, and allows the roll to rest on the table. There is some advantage in economy also, since only so much paper as is actually required for the drawing need be used, and the sheet may be cut where necessary.

Bullseye Plumb-Bob Reflector

About a year ago I "evolved" a reflector that has proved quite efficient, being durable, of small size (it can be carried in the pocket), cheap, easily made and can be held in the proper position with the lamp, in one hand, leaving the other free to align the bob in setting line sights, says H. A. Schmieding, in *Coal Age,* Nov. 25, 1916. The manner in which this is done, as well as an idea of the construction, is shown by the illustration.

The frame of this reflector, or "bullseye," as it is called, is made by cutting the centers from two "push" lids from lard or syrup pails (the kind that are removed with a knife, screwdriver or coin), obtaining a ring about ¾ in. wide with a raised edge from each lid. Two circular sheets of clear mica cut to a little less than the outer diameter of the frame (not the hole) with "onion skin" paper between, form the ground or field. The paper is more transparent than tracing cloth, but is still sufficiently opaque to offer a good background when illuminated. It is also less affected by heat or moisture.

As the frames cannot be forced together close enough without distortion to clamp the mica, two ring gaskets of heavy blotting paper are placed between the mica and the tin, one on each side. This prevents the mica and



THE REFLECTOR IN USE

the paper from shifting and excludes dirt and dampness.

To assemble, place the various parts in one of the frames (laid with the raised edge up), place the other frame in, also with the raised edge up, and force together by pinching the flanges together around the raised edges with a pair of pliers.

When in use the lamp should be held so that the flame is parallel to the mica. The paper or mica will seldom need renewing, but when renewal is necessary it takes but a few moments' time.

A wire handle arranged to hold the lamp could be soldered to the periphery of the outer frame (so as not to interfere with taking the reflector apart), if desired,

but I have not found this necessary, as the bob can be steadied with the fingers holding the bullseye and lamp, or after a little practice with the edge of the bullseye.

Several engineers in this section have adopted this reflector and express great satisfaction with it.

Electric Shovel at Granby Mine, Phoenix, B. C.

By C. M. Campbell*

Early in 1914 a Bucyrus 40-R electric shovel was purchased for use on the No. 2 tunnel level of the Granby mines at Phœnix, B. C. The reasons that seemed to justify the purchase of a power shovel were as follows: (1) Waste could be handled more cheaply by loading large masses direct instead of drilling and blasting and then handling from a lower level. The large quantity of waste to be handled, amounting to about half the total output, made this reason an important one. (2) Most

ELECTRIC SHOVEL IN USE AT GRANBY MINE, B. C.

of the ore could be handled fully as cheaply, with the additional advantage of having no development work. (3) Ore could be cleaned up to the sill floor, resulting in longer life for the shipping plant at that level and also eliminating a hoisting charge on some ore. (4) Where ore and waste were more or less mixed, a better separation could be obtained. (5) All mine cars could be loaded to their fullest capacity.

The advantage of electric power over steam may be described in the words of an advertisement: "Why bother with coal, service pipes, water supply and other inconveninences common to all steam-driven shovels when you can do away with them by using electric shovels? Electric shovels are always ready for work at a minute's notice and are most economical to maintain and operate." As electric power was available, it was decided to purchase a shovel of this type.

*Superintendent, Granby Consolidated Mining, Smelting and Power Co., Phœnix, B. C.

During the period the shovel has operated, it has handled about 500,000 tons of material at a cost of about 45c. per ton. As a considerable amount of the ground in front of the shovel had been worked by underground methods, this was caved as much as possible and the broken rock drilled with small drills. In this way some saving was made in labor and powder charge, though this item is still large. A considerable amount of shoveling was done where the face was low, necessitating frequent delays on account of blasting and track laying. Enough work has now been done to enable the shovel to have two positions in which to work. This lessens delays on account of lack of muck and makes it safer for the shovel crew, as the miners can be drilling and barring down at one place while the shovel is operating at the other. Another delay has been due to the fact that the shovel has had very little chance to work along the side of the orebody, but has had to work right into it. For this reason only one or two cars could be loaded at a time instead of a train. The introduction of 10-ton automatic side-dumping cars instead of smaller cars previously used has increased the capacity of the plant. These cars will allow a rock 4 ft. in diameter to pass through. When a rock larger than this is met with and not too large to be handled by the shovel, it is lifted by a chain or cable onto a side-dumping flat car. This makes it unnecessary to move the shovel for anything but large blasts.

The electric feature of the shovel has given entire satisfaction. The delay on account of shovel repairs amounted to only 3½% of the total time, and only a small part of this was spent in attendance on the motors and electrical equipment.

New Rescue Apparatus of the Bureau of Mines

Dr. John Scott Haldane, the noted English physiologist, recently delivered a number of scientific lectures at Yale University, New Haven, Conn., and Johns Hopkins University, Baltimore, Md. He took enough time from his lectures to visit the Pittsburgh experiment station of the United States Bureau of Mines. He expressed much interest in the various investigations that are being carried on in behalf of the miner and put on and wore the new Gibbs oxygen breathing apparatus, which is now undergoing severe tests by the rescuers of the bureau. In fact Dr. Haldane made the statement that although the apparatus had certain defects, which might be modified, it was the best apparatus that has yet been devised.

Dr. Haldane is said to have remarked that no matter how much he exerted himself when in the apparatus it never failed to supply him with the needed oxygen. In a recent article read before the Canadian Mining Institute James M. Stewart, speaking of apparatus in general, declared that "the amount of muscular energy expended must be made to correspond to the output of oxygen of the apparatus. The oxygen supply cannot be regulated to suit calls on muscular energy as they may arise in the mine. Cool, calculated work is what is likely to make a man wearing the apparatus a success as a member of a rescue party."

Should the coördination of need of oxygen with its supply prove as perfect in the Gibbs apparatus as has been anticipated, then evidently an important step forward will have been made.

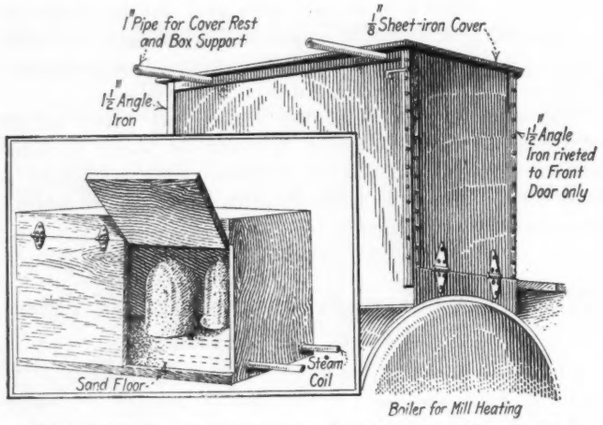
Details of Milling and Smelting

Crucible-Seasoning Chests

By Arthur C. Daman*

Considering the high cost and comparatively short life of the domestic crucibles used in refining gold and silver precipitates, it is advantageous to take all precautions in lengthening their life. We have inside and outside corrosion, cracking and other troubles. The least expensive and probably greatest life extender for crucibles is proper seasoning, especialy when they have become damp in transit or storage.

At the Commonwealth Mines, Pearce, Ariz., a wooden chest, with steam coils covered with sand, is used. The chest holds four crucibles, and by the time required, they are thoroughly seasoned. Since using this chest the life


1" Pipe for Cover Rest and Box Support
1/8" Sheet-iron Cover
1½" Angle Iron
½" Angle Iron riveted to Front Door only
Steam Coil
Sand Floor
Boiler for Mill Heating

TWO FORMS OF CRUCIBLE-SEASONING CHAMBERS

of a crucible has been increased from 10 to 25% which, considering the initial cost (between $50 and $60), amounts to quite a saving.

At the Churchill Milling Co.'s mill, Wonder, Nev., a sheet-iron seasoning box is placed above the mill heating boiler. As shown by the sketch, the top and front sides open on hinges, and the crucibles are lifted out by means of chain blocks.

The Nevada Hills Mining Co. at Fairview, Nev., keeps two or three crucibles in the bullion vault and inside of each is placed a 110-volt electric-heating element. This latter method is successful, though it takes a considerably longer time to season and costs more.

Australian Stamp-Milling Hints†

In the modern Australian mill the rock breakers should be made to play a more important part in ore reduction than is the case at present. Not enough attention is paid to this department in the ordinary mill, and as a consequence, the duty per stamp in many Australian mills is very low.

Sufficient jaw-breakers of the Blake-Marsden type should be installed to reduce the ore at the start to 2-in. cubes. Screening should follow, and the oversize should be crushed in a Gates crusher set close enough to reduce the whole product to pass a 1-in. ring.

If the Australian stamp batteries were fed with ore reduced to this degree of fineness, the weight of the stamps and the height of drop could both be minimized, while the drop per minute could be increased with a corresponding improvement in the stamp duty.

It is considered that the crushing surfaces of the ordinary uptodate stamp shoe and die are far too small—only 9 to 10 in. in diameter. This diameter should be increased to from 12 to 14 in. This would necessitate enlarging the present type of mortar box or reducing the number of stamps now employed in each mortar to make room for the new arrangement.

Matte Granulation in Missouri*

The matte granulator installed Mar. 1, 1915, had, up to Jan. 1, 1916, handled 18,735 tons of matte. Previous to its installation matte was cooled in small pots, broken by sledges, transported to a crushing plant and reduced to ¼-in. size before feeding to the roaster bins. The costs by this method were $0.87 per ton for cooling and sledging, while crushing to ¼-in. cost an additional $0.56; total cost, $1.43. Granulation by the new method costs a total of only $0.75 per ton, a saving of $0.68 per ton over the old method.

By the new method the matte tapped into 6-cu.ft. iron ladles is transported by electric crane to the granulator. Here it is poured into a cylindrical container constituted by a specially designed Traylor copper converter minus the tuyeres, but having a 20-in. opening at one end for the flue and equipped with oil burners. Inside measurements are 77x120 in.; lining, 9 in. of magnesite brick; tilting accomplished by a 50-hp. motor. To prevent metal losses, the container is covered by a swinging hood, except during pouring from the crane, which fits over the charge opening and connects with an 18-in. flue conducting fumes to the baghouse. Two oil burners are placed under the flue within the container, although one usually suffices to keep the matte molten. The consumption of 18° to 20° Bé. crude oil is 250 gal. per 24 hr., or 2 to 2½ gal. of oil per ton of matte granulated. Air at 30 lb. pressure is supplied to the burners for atomizing the oil.

The granulation is accomplished by pouring the molten matte through two superimposed flat jets of water shooting horizontally into a concrete tank lined with cast-iron plates. The stream of matte is disintegrated into small shot-like particles before reaching the body of water. It is accurately directed on the jets of water by a so-called pouring box, the spout of which is 6 in. above and 12 in.

*Mining engineer, 2678 Eudora St., Denver, Colo.

†Excerpt from "The Milling of Gold Ores," by J. McCombie, consulting engineer, Auckland, New Zealand; "Min. and Eng. Review," Oct. 5, 1916.

*Abstract from "Matte Granulation at Herculaneum, Mo.," by S. Paul Lindau, Herculaneum, Mo., and Hery B. Smith, Rivermines, Mo., to be presented to the New York meeting of the A. I. M. E., February, 1917.

in front of the upper nozzle. This box is lined with common brick, and the matte is poured directly into it by revolving the container. The pour holes are slots 2 in. wide by 8 in. high.

The average rate of pouring the matte is 3.2 cu.ft. per min. The water supplied to the two superimposed flat jets on which the matte impinges is 100 gal. per min. under a head of 40 ft.

The receiving granulating tank is constructed of concrete, 17 ft. long and 7½ ft. wide, the floor being plated with 1-in. cast-iron plates, and sloping at 30° into the conveyor trough. This degree of slope has been found sufficient to cause the granulated particles to run into the trough.

The granulated matte is removed from the tank by a dewatering drag conveyor placed to one side out of the way of the jets. This conveyor, running in a sectional cast-iron trough 4 in. deep by 15 in. wide and driven at a speed of 30 ft. per min. by a 10-hp. motor, elevates the matte over the slag track and discharges into standard-gage railroad cars. The latter are weighed and their contents sampled before emptying into the roaster bins.

In the end of the concrete tank opposite the nozzles, a V-shaped settling box takes the overflow water. This box prevents the loss of the coarser slime, while the finer material settles out in a series of settling tanks, one overflowing into the other. An excelsior filter finally clears the water before it enters the circulating pond. There are two series of settling tanks, one in use while the other is being cleaned out.

Some lead settles out of the matte while in the container, about 30 to 60 pigs of 65 lb. each, according to the condition of the furnaces, being poured out daily. In case lead goes over and is granulated with the matte, it manifests itself by a sputtering and popping on the surface of the water. After the matte has been poured down to the lead level, the operator turns the container backward and pours the lead into a ladle, whence it is molded into pigs.

This installation requires only two men per shift for operation, one to operate the container and one the crane. The forehearth tappers at the furnaces attach the crane hook to the ladles.

In summary, by the use of the granulator, 100 tons of matte per 24 hr., at a cost of only $0.75 per ton is granulated to the following screen analyses: On ¼-in. mesh screen, 5%; on $\frac{3}{16}$-in., 4%; on ⅛-in., 14%; on $\frac{1}{16}$-in., 35%; through $\frac{1}{16}$-in. mesh, 42%.

Grondal Flotation Apparatus

To improve the opportunity for contact between ore particles and oil in flotation is the object of a newly devised apparatus. Hitherto as intimate contact as possible has been made either by stirring or by adding the oil to the ore during the process of fine grinding. The present invention seeks to secure moistening of the ore particles in the following manner: Oil is fed into a Körting steam jet, where the steam under pressure draws a large volume of air into the pipe leading to the bottom of a mixing chamber. The terminus of this pipe is formed by a funnel just above, which is the terminus of a pipe feeding the ore pulp suspended in water into the water-filled mixing chamber. The descending stream of ore pulp meets the stream of steam, air and oil rising from the funnel, resulting in extremely active agitation of the ore pulp and contact with the oil particles. The resulting bubbles buoy the ore particles to the surface of the mixing tank, where they flow over a partition into an adjacent Callow tank. Here the gangue particles sink and are drawn off through a valve, while the mineral particles overflow into a collecting launder. If desired, the gangue particles may be led into another similar device and again treated. The apparatus is the invention of Gustaf Gröndal, a subject of Sweden, to whom has been granted United States Patent No. 1,202,512 on Oct. 24, 1916.

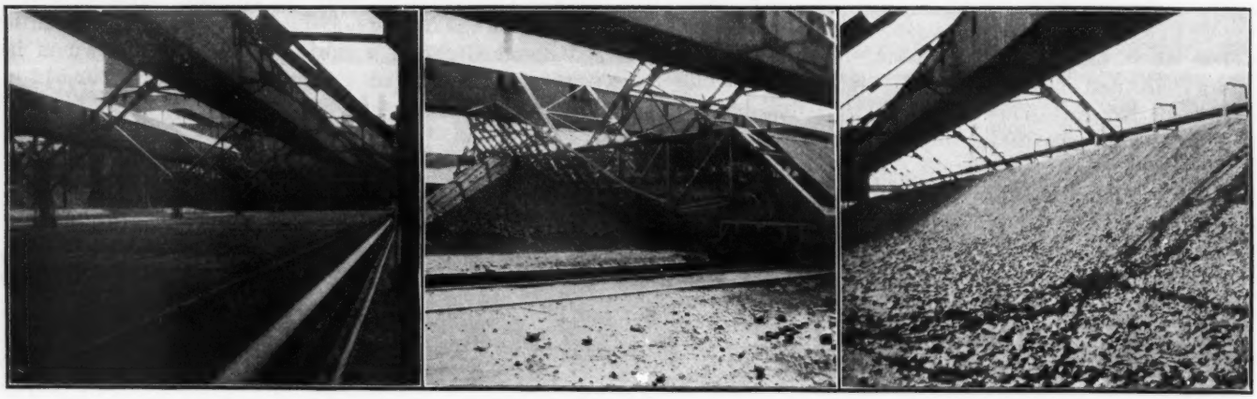
Lubrication at Milling Plants

The standard of lubrication may be determined from a consideration of the frictional heat generated in any bearing, and thus by accurate temperature tests it is possible to make a comparison between different oils, according to *Chemical Abstracts* in review of articles in the technical press. Chemical tests of the oils are of no value for this purpose. The internal lubrication of steam engines with a cup feeding oil directly into the cylinder or valve is not satisfactory. The oil is carried out to the exhaust at once in a mass.

An improved oil atomizer for this purpose has a spoon-shaped open end leading the oil into the center of the steam pipe where the velocity is greatest. This breaks the oil up into a fine spray, and it is evenly distributed. Cylinder oils with a flash point lower than the steam temperature have been used successfully for superheated steam. This is because the flash point is determined at atmospherical pressure, and at the steam pressure it will have a higher value. There is no air present in the steam to affect the oil either. Oil elimination from feed water by electrical and other processes is referred to. Sometimes deposits of solids carried over by the priming of the boilers have been mistaken for carbonization of oil. It is necessary to drain water from crank chambers and reservoirs at frequent intervals. The continuous circulation of oil results in its "breakdown," owing to the action of heat, moisture and air. This is attended with an increase in the viscosity and the specific gravity, while acidity develops and sediment is deposited. Oil vapors from bearings and tanks are sometimes drawn into dynamos owing to the fact that oil in rapid circulation forms bubbles which burst into a fine spray in air. Petroleum acids as a result of the "breaking down" of the oil are distinct from the H_2SO_4 left in the oil from the refining processes. One main bearing of a dynamo should be completely insulated to obviate leakage current from passing through the bearings and decomposing the oil. The lubrication of various types of mining machinery and oils suitable for transformers and oil switches are described.

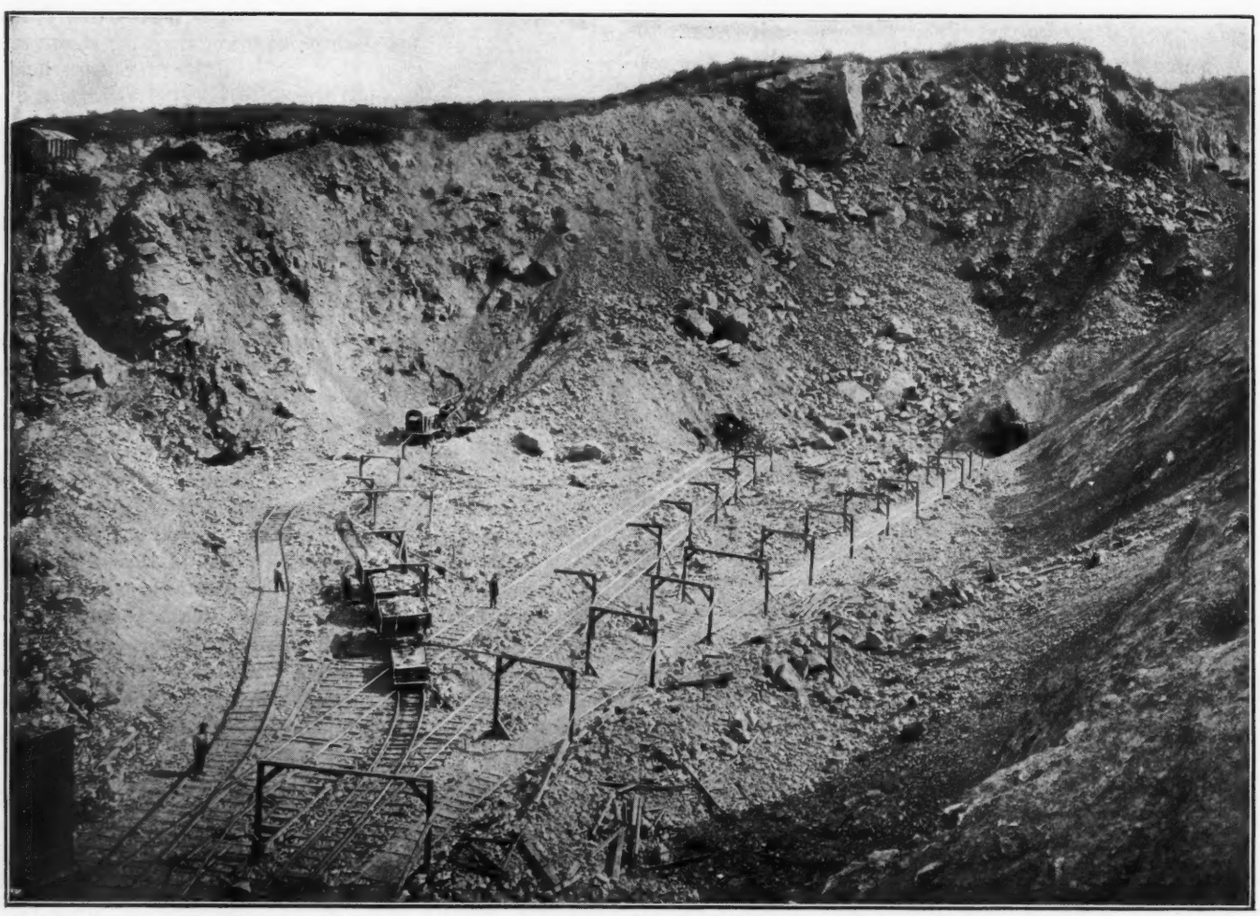
Alloys for Withstanding High Pressures were discussed by S. D. Sleeth at the September meeting of the Institute of Metals. As a suitable mixture for ordinary castings such as cocks, pistons, bushings, etc., he gives Cu, 72.50%; Sn, 1.75%; Zn, 19.25%; Pb, 6.50%. For high pressures he recommends Cu, 82.00%; Sn, 7.50%; Zn, 4.75%; Pb, 5.75%, and Cu, 83.00%; Sn, 11.50%; Zn, 4.00%; Pb, 1.50%. These alloys are hard to machine. He states also that a very small proportion of aluminum will make the castings porous throughout, even though the castings look solid. Iron and antimony also are detrimental.

Photographs from the Field



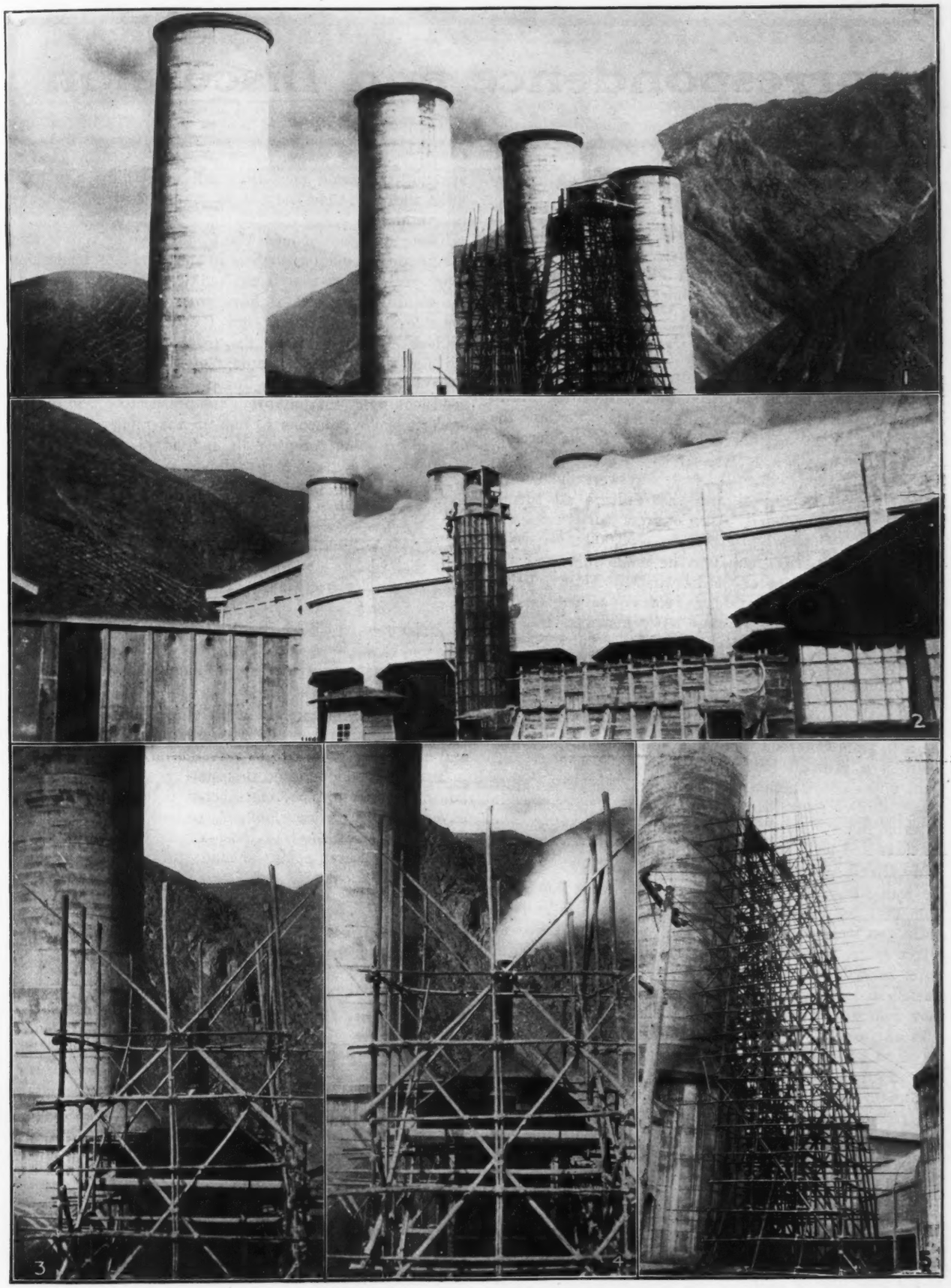
MESSITER BEDDING SYSTEM AT CALUMET & ARIZONA SMELTERY, DOUGLAS, ARIZ.

Bedding of ores, formerly only practiced by lead smelters, has become popular among copper smelters, particularly in the Southwest. The accompanying views, beginning at the right, show the ore bed formed, being reclaimed with a Messiter machine and the bed completely reclaimed.



OPENPIT OF THE GRANBY CONSOLIDATED'S COPPER MINE AT PHOENIX, B. C.

This openpit is being worked by an electric shovel—a Bucyrus 40-R. The pit has been widened to permit the use of two divergent tracks which reduce delays. Drilling and barring down is done in one part while shoveling is proceeding in the other. This is described more in detail on p. 979 of this issue.



FIRST COTTRELL PRECIPITATION PLANT IN JAPAN

Test installation of Cottrell electrostatic precipitation at Ashio smeltery of Furukawa Mining Co. (1) Bamboo scaffolding supporting gas-measuring platform at No. 2 stack; light-line squares at left are straw ropes laid to prevent erosion of mountain sides. (2) Concrete dust flue. (3) Cottrell test treater, power on; (4) same, power off. (5) Bamboo scaffolding in process of erection, without saw or hammer; poles bound together by straw ropes.

Correspondence and Discussion

Not Always a Wildcat

I noticed in the issue of the *Journal* of Oct. 28, 1916, that a correspondent had discovered a brood of wildcats. I didn't know they came in broods. I am an old-time prospector and miner, but don't claim to know much about wildcats, mines and mining; though I am very anxious to learn. Therefore I ask the correspondent if he thinks the man is always correct in yelling "wildcat" on the slightest provocation. Isn't it possible that the cry "wildcat" might be in the interest of the big copper producers? He seems surprised that the United States Government doesn't get after the wildcats. Perhaps the Government is not anxious to put a stop to the development of new copper properties.

If this doubter is always correct, why were the United Verde, Hillside, Congress and the Vulture all turned down at different times? The Congress ran steadily for 22 years. The Vulture produced $17,000,000. Mr. Lawler is, or was, a rich man and he made it out of the Hillside. Ask ex-Senator Clarke what the United Verde produced. All these have been classed as wildcats in their time. Let me quote from a letter just received from an old Arizona friend. He says: "It is 20 years ago that we had the Ajo group of claims under option from old Tom Childs and Mr. Westbrook for $35,000. The best experts of that day examined the group, and they all pronounced it a wildcat and an impossibility. You sent one man from Colorado there, and he turned it down flat. There is a railroad built from Gila Bend and a large plant under construction. I understand the entire property, including the railroad, plant and mine, has increased its value many times." That was a wildcat that showed his claws and teeth to every expert that went near it.

My friend continues: "Of course you remember the old Mexican silver mine on Slim Jim Gulch and the Uncle Tom that you once had an option on from me, and the claim you located across the gulch opposite the Mexican Silver mine, that were all turned down and called the worst of wildcats by that foxy red-headed expert that started in to be abusive because you had the audacity to show him such wildcat property? Said he would just as soon advise men to invest in a school of herring in the sea as to put money into such wildcat property as I had showed him. The Mexican Silver mine is now called the Monte Cristo and has 2½ mi. of underground workings, and I understand Ezra Thayer has refused $4,000,000 for it. Furthermore, there has been sufficient work done on the Uncle Tom to show that it is a better property than the Monte Cristo. And the claim you had across the gulch from the Monte Cristo has sold for $500,000." They were all wildcats, and if stock companies had ever been formed and the stock offered to the public, the wildcat hunters would all have been bitten or scratched and would have died of rabies.

The effort to put any new mining property on its feet, and especially if it is done through the attempted sale of stock, gives some men spasms, and I often wonder if they are not the same men that call everything a wildcat until the ore is blocked out so they can measure it and take samples.

There is a class of men who would have us believe that the greatest crime on earth is to solicit money to develop a prospect. Such men in my opinion are a detriment to the mining industry. I have no copper or other stock for sale and don't know that I ever will have. If the wildcat hunter will take the trouble to investigate, he will find that a large percentage of the big bonanza mines were once prospects and that some of them not extra good-looking at that, and that the prospectors who discovered them got someone to put up the money to develop or sold to some company or individual who formed a company and sold stock in order to make mines of them. He will also find that at one time it was next to impossible to sell Calumet & Hecla at $3 a share and it was considered one of the greatest swindles ever offered to the American public. It is now $630 per share. I suppose that it was a wildcat, like many others! If every prospect is a wildcat and every man who attempts to raise money to develop the prospect is a criminal and should be prosecuted by the United States Government, then tell me, Where are we going to get mines? Order them from Sears & Roebuck, of Charles Williams Stores, I suppose!

Ruffin, N. C., Nov. 23, 1916. JOHN LORD.

[There is something in what our correspondent says. Doubtless many prospects have been rejected as worthless and have since proved to be valuable. Humans are likely to err. In condemning this particular kind of error, however, it should be remembered that many prospects have proved, upon development, to be worthless, and the chances are that most of those rejected after competent examination never could be made into mines.—Editor.]

Winter Gravel Washing in Siberia

In the September issue of the *Mining Magazine,* of London, there appears an article by Reuben Edward Smith and myself on "Winter Washing at the Lenskoi Mines, Siberia." Owing to the fact that neither Mr. Smith nor myself was in London when the article went to press, an erroneous subheading was inserted, making it appear that the thawing of frozen gravel was one of the operations involved. As we clearly set forth in the body of the article, and as the writer has previously stated, the auriferous gravel now handled in the Lenskoi drifting operations is for the most part unfrozen. Even when encountered in a permanently frozen state, the thawing artificially is one of the underground mining operations and has no relation to the washing methods described in the article referred to. May I crave your space for the insertion of this letter so that no misconception may occur? CHESTER WELLS PURINGTON.

London, Oct. 23, 1916.

Testing Mine Rescue Apparatus*

By C. E. Pettibone†

SYNOPSIS—The author advocates a test of breathing apparatus by which parts of the apparatus are plugged and subjected to an internal pressure of 5 oz. Should this pressure, which is twice the maximum experienced in use in any part of the apparatus be retained without noticeable decline for one minute, the apparatus is regarded as sufficiently tight against any inleakage of dangerous gas in a poisonous atmosphere.

This paper describes some experiments that we have been conducting on the testing of mine rescue apparatus for Pickands, Mather & Co. I am desirous of obtaining a general expression as to the practicability of the test here described.

This test has been applied to the Draeger apparatus, which is the type of apparatus we are using. We believe, however, that the principles of this test can be applied to any type of rescue apparatus, it being only necessary to develop a few connections and make other unimportant modifications.

Many articles and much discussion have been devoted to setting forth the dangers that might arise and have arisen from leaks in breathing apparatus. Any consideration of the merits of different types of these apparatus has always brought up the question of negative pressure, or suction, and of the amount of the apparatus which is under such pressure.

In order to satisfy ourselves that leaks in the apparatus are important, we tried the following experiment with an apparatus not of the positive-pressure design. We sent several men into a smokeroom filled with formaldehyde

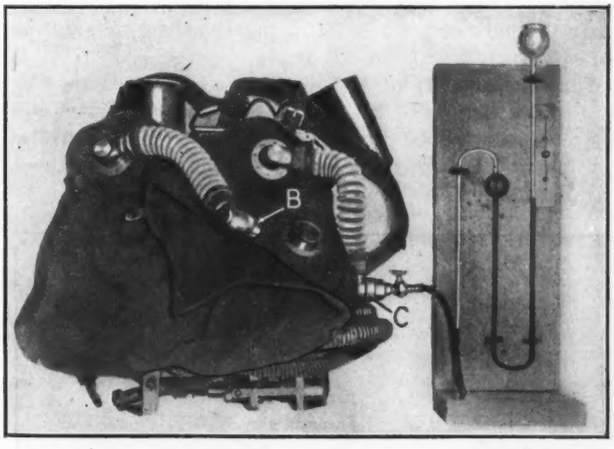


FIG. 1. TESTING THE WHOLE APPARATUS FOR LEAKS

fumes. All the men had good cartridges in their apparatus. They were told to come out as soon as they recognized the odor of the formaldehyde vapors. None of them had any trouble with his apparatus, and the men were called out.

A cartridge with a small hole was then inserted in the apparatus worn by one of the men, but none knew which man had the defective cartridge. In a short time the man with the punctured regenerator was obliged to retire. This test was tried several times, and in each case the man with the defective cartridge was unable to remain in the formaldehyde fumes.

A similar operation was tried with the Fleuss apparatus, a hole being cut in the inhalation tube that connects the breathing bag with the mouthpiece. Similar results were obtained. There was therefore convincing evidence that leaks in the apparatus would prove very serious, if not fatal, when operating in poisonous gases such as carbon monoxide. It was probably because of criticism of this character that the Draeger Oxygen Apparatus Co., several years ago, changed its apparatus to what is known as the positive-pressure type, in which a greater portion of the apparatus in use is placed under positive pressure. The ordinary tests, made with the liter bag and gauze, show only that the reducing valve and injector are furnishing the desired quantity of oxygen and are producing the required positive and negative pressures necessary to maintain the circulation of air through the apparatus. Neither of these tests will indicate leaks. We established this fact by testing the apparatus with the punctured potash cartridge mentioned previously.

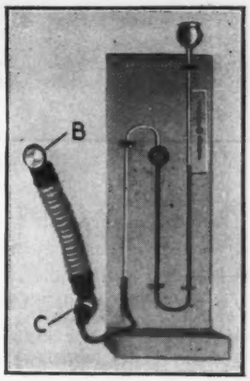


FIG. 2. PROVING THE FLEXIBLE TUBES

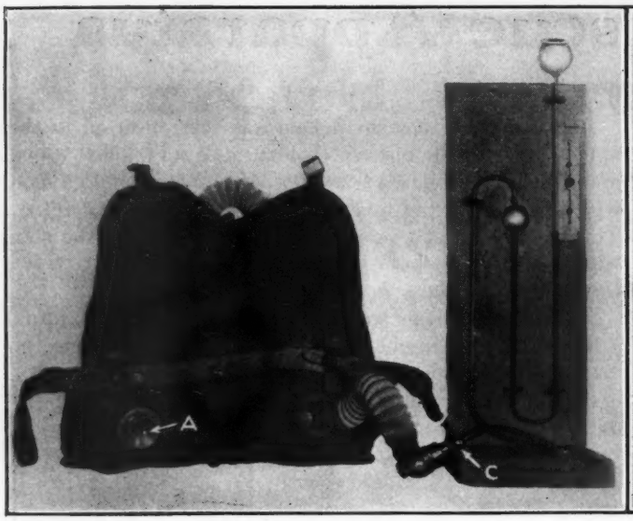
The "smokehouse test," which consists in wearing the apparatus in smoke or formaldehyde fumes, will not indicate leaks in parts of the apparatus that are under positive pressure, and it is questionable whether minor leaks in those parts that are under negative pressure would be discovered. Of course leaks of this latter type, if not determined in the smokeroom, would probably not be dangerous in the actual use of the apparatus, unless they become larger. But danger lies in the fact that such minor leaks would, in all probability, become larger and more serious while the apparatus was being worn in actual mine rescue work.

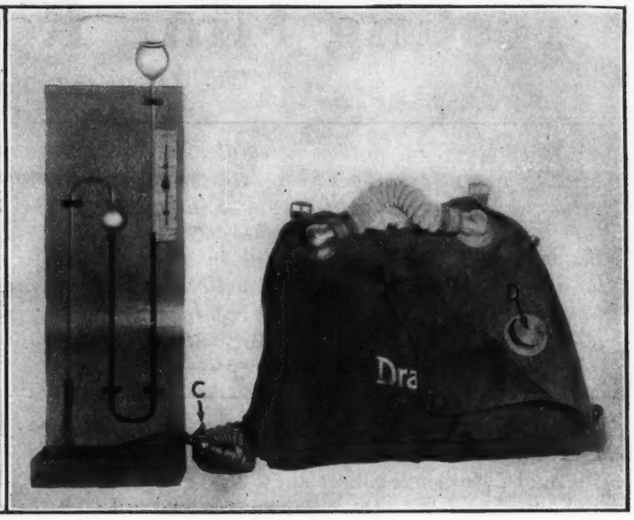
It was therefore felt that some more definite method of determining leaks was desirable. At first we used different kinds of rubber plugs, and made other provisions by which we were able to blank off the open ends of the apparatus. Then, by admitting oxygen from the cylinder, the entire apparatus could be put under pressure. The apparatus was then immersed in water, care being taken to keep the finimeter above the surface.

Many leaks that could not otherwise be determined were thus made apparent. But there were several objections to this manner of procedure. First, the pressure put on the apparatus was not known; consequently, it was not determined whether the apparatus was being overstrained; second, the constant immersing of the apparatus in water is unquestionably not beneficial.

*Abstract of a paper read before the Mining Section of the National Safety Council, Oct. 20, 1916. The experiments described were conducted by H. L. Scheiber, Palatka, Mich.

†Director, Department of Safety, Welfare and Insurance, Pickands, Mather & Co., Cleveland, Ohio.





FIGS. 3 AND 4. U-TUBE IS ATTACHED TO THE BREATHING BAG AS SHOWN

Later, we were able to obtain from the Draeger company three testing parts by which the various connections could be blinded and whereby proper connection could be made to a pressure gage. These parts are lettered *A*, *B* and *C* in the various illustrations. We endeavored at that time to induce this company to make a cap for the relief valve of the bag, but it objected to doing this on the ground that some one might wear the apparatus with the cap in place over the relief valve.

We made two types of blanks for this valve, one which fits tightly over the valve and the other made by soldering up the relief valve of an old bag. The former blank is preferable, as it can be used without removing the relief valve. In the illustrations this valve is marked *D*. The Draeger company is now furnishing a blank for this purpose.

In all discussions, and in talking with sales agents of the various apparatus, I have never seen or heard of any figures that give the pressures actually existing in the different parts of the apparatus under normal operating conditions.

We developed a water U-tube, as shown in the various illustrations. This was graduated for the reading of pressures in tenths of ounces. By soldering a pipe in the side of a potash cartridge near the base, and by other connections, we were able to tap in on the circulation and obtain the pressures existing under normal operation at five different points in the apparatus. The following results are the average of tests of several apparatus with different men wearing them, and with the breathing bag set to release at $+2\frac{1}{4}$ oz.:

Test No.	U-Tube Attached to	During	Minimum Pressure in Ounces
1	Inhalation tube between bag and mouthpiece	Inhalation	$\frac{3}{4}$
		Exhalation	1 to $2\frac{1}{4}$
2	Exhalation tube between bag and mouthpiece	Inhalation	$\frac{1}{4}$
		Exhalation	$1\frac{1}{4}$ to $2\frac{1}{4}$
3	Inhalation tube below bag	Inhalation	$\frac{1}{4}$
		Exhalation	$1\frac{1}{2}$ to $2\frac{1}{4}$
4	Exhalation pipe below bag	Inhalation	$-\frac{1}{4}$
		Exhalation	$\frac{3}{4}$ to 2
5	Bottom of potash cartridge	Inhalation	$\frac{1}{2}$
		Exhalation	$1\frac{1}{2}$ to $2\frac{1}{2}$

It will be understood that the pressure as measured is positive, except in the exhalation pipe below the bag during inhalation, where it is a negative pressure as indicated.

Thus the maximum pressures in the apparatus are $2\frac{1}{2}$ oz. in back parts and $2\frac{1}{4}$ oz. in front parts. When the bag releases at $2\frac{1}{4}$ oz. in front, $2\frac{1}{2}$ oz. are recorded in the back parts. This pressure is about what can be obtained by inflation with the lungs.

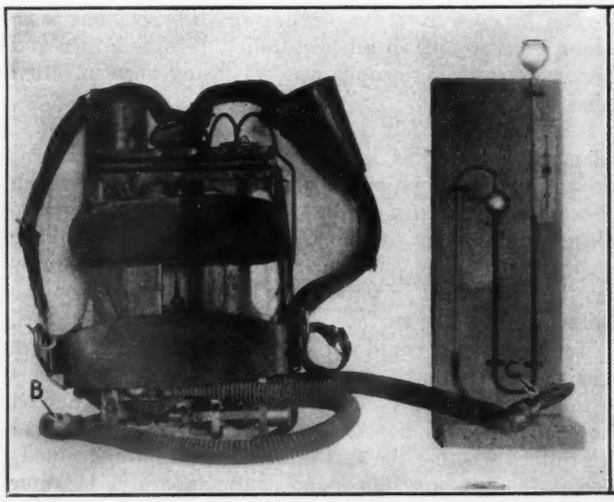


FIG. 5. TESTING ENTIRE BACK OF APPARATUS

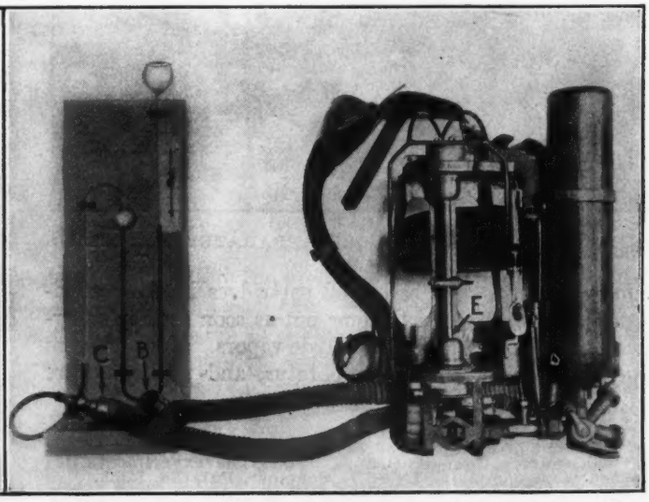


FIG. 6. PROVING TIGHTNESS OF BOTTOM PARTS

After determining the maximum pressure under which the apparatus operated—namely, 2½ oz.—we decided to test it with 100 per cent. overload—namely, at 5 oz. of pressure. We found it was impossible to make the apparatus so tight that the water in the U-tube would permanently remain at 5 oz. This was due unquestionably to infinitesimal leaks in the fabric and valves.

We found, moreover, that if the smallest possible pinhole was made in the potash cartridge, the pressure would be relieved and the water drop in not longer than one-half minute. We therefore decided that the apparatus should be considered as being in good condition when under a pressure of 5 oz., if the water did not fall in less time than one minute.

In operation, the U-tube is filled with water to a point just below the reservoir, and the scale is adjusted so that zero on the scale corresponds to the height of the water. Care must be taken to make sure that there are no bubbles of air in the column.

The tests are as follows: Test 1—Connect the entire apparatus as shown in Fig. 1. Blank off one tube at the top of the bag with the test plug *B*. Connect the other tube to the stop-cock *C* of the testing set and attach this to the U-tube. Plug up the release valve with the plug *D*. Admit oxygen very slowly from the cylinder until a pressure of 5 oz. is obtained. Shut off the oxygen. If the apparatus is free from leaks, the water will remain at this level or descend very slowly, taking longer than one minute to descend. If the test shows leaks in the apparatus, they may be located by testing portions of the apparatus as follows, but whenever a leak is located and corrected the entire apparatus should be connected up and retested. Test 2—Test the flexible tubes as shown in Fig. 2. Test 3—Using tubes tested in test 2, test the bag as shown in Figs. 3 and 4. In tests 2 and 3 inflation can be obtained from the lungs or a small pump. Test 4—Test the entire back of the apparatus as shown in Fig. 5.

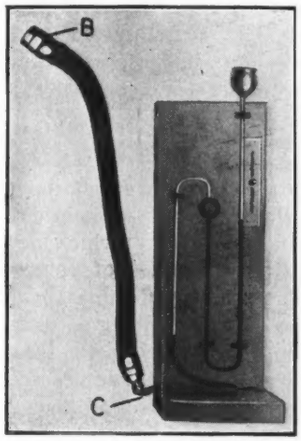


FIG. 7. PROVING CIRCULATION PIPES

If a leak is indicated, it is advisable to remove the potash cartridge and insert the cartridge plug *E*, shown in Fig. 6. It consists of two bell-shaped cups connected by a pipe fitted with a stop-cock. While the valves at the top and bottom of the potash cartridges are shut when the cartridge is removed, they do not close tight enough for this test.

Test 5—Test both circulation pipes, as shown in Fig. 7. Test 6—Using tested circulation pipes, test the bottom parts by closing the stop-cock in the cartridge plug described above, as shown in Fig. 6. Test 7—Test the entire back parts with the stop-cock in the cartridge plug open, using tested circulation pipes.

When a leak has been localized, it can usually be found by feeling with a damp finger. If not, the part may be immersed in water. The foregoing tests of the apparatus if made monthly, will maintain it in excellent condition. In case of actual rescue work, the testing of the entire apparatus, as described, consumes only a few minutes; and if desired, the usual pressure test of the reducing valve and the injector can be obtained from the U-tube. Of course, the smokehouse test can be employed in addition to those just described.

Northwest Mining Association on Mining Law Revision

The Mining and Metallurgical Society of America has been the promoter of the general movement to secure an adequate revision of the mining laws of the United States. In this movement it has sought the coöperation of other organizations of mining men and found a ready and hearty response. In the preliminary effort to crystallize the opinion of mining men into approved general principles that should govern the drafting of the proposed detailed revised law, the society recently submitted a questionnaire to its own members and to the other organizations. This questionnaire was published in the *Engineering and Mining Journal* Oct. 14, 1916. In response to this questionnaire, the recent convention of the Northwest Mining Association adopted the following resolutions:

Whereas, It is generally understood and agreed in mining circles that a revision of our Federal mining laws has become absolutely necessary to the welfare of the mining industry of the United States; and

Whereas, It is the belief of the members of the Northwest Mining Association that any new code that may be enacted should be as free from restrictions as possible, offering every inducement to those wishing to prospect for mines and to operate them, and guarding only against fraudulent appropriations of public lands for purposes other than those pertaining to mining; and

Whereas, The Mining and Metallurgical Society of America has undertaken to draft an adequate bill for presentation to Congress, which bill shall cover all necessary changes in our present mining laws; and

Whereas, The mining committee of the said society has requested a statement of the views of members of this organization in respect to the proposed changes outlined in a questionnaire, dated Oct. 2, 1916; now, therefore, be it

Resolved, That this organization submit the following suggestions and replies to the aforesaid questionnaire as an official expression of the opinion of its members:

1. The phraseology, legal definitions and principles of administration of our present mining laws should be preserved to the maximum extent possible.

2. The new mining laws should cover clearly and definitely all classes of valuable mineral deposits other than coal.

3. The new laws should authorize mineral locations without discovery in any part of the public lands officially classed as mineral.

4. The new laws should authorize mineral locations upon discovery in any part of the public lands whether officially classed as mineral or nonmineral or set aside as reserves; hence

5. There should be an express provision permitting bona fide prospecting upon all public lands, as above described, and protecting the prospector meanwhile.

6-9. Patents should not be granted unless a discovery of mineral has been made; provided, however, that this shall not apply to mill, tramway or tunnel sites or to other ground conclusively shown to be necessary to successful mining operations.

The number of claims patentable upon a single discovery of mineral should be limited to four contiguous claims, whether the same be grouped about the point of discovery or located along a well-defined strike or in series where no outcrop is apparent.

10-12. This organization strongly advocates the adoption of a standard claim 1,500 ft. square (51.65 acres) because this is the square of the long side of our present claims and it introduces no fractions of 100 ft. Under the proposed abandonment of the extralateral right a claim of this size is none too large, while the difference between its area and that of a claim 1,320 ft. square is not sufficient to cause hesitation. This organization is unqalifiedly opposed to the adoption of a claim containing less than 40 acres, since smaller units

would merely confuse locators and require more locations to be made.

13-14. For several practical and important reasons this organization is also unqualifiedly opposed to the idea of requiring claims to be located as subdivisions of surveyed sections or with lines running north-south and east-west on unsurveyed lands. Such conformity is both impracticable and unnecessary; to enforce it would be merely to place additional obstacles in the way of the prospector, particularly in rough or heavily timbered and brushed districts. No possible confusion could result from permitting the locator to use his own judgment in staking his claims, since all claims require readjustment when accurately surveyed, and fractions are bound to occur in any case and under any system. Moreover, the abandonment of the extralateral right will automatically remove practically all the difficulties introduced by our present system.

15-16. The number of claims locatable by one person or association should be unlimited.

17. The present regulations governing marking, notice and record of locations are susceptible of considerable improvement. They should be so changed that the public may easily discover (upon the ground) what land has been covered by claims and by whom. The present method of staking and marking is shiftless and temporary in a large majority of instances. The official surveyor alone should destroy all corner posts of abandoned claims after having noted their exact location for record wherever such notation is necessary; a penalty should be provided for the removal or destruction of corner posts by anyone but the surveyor. The locator should be permitted to stake his claims according to his judgment, provided only that they be so staked and the stakes so plainly marked that the boundaries of his claims may easily be followed.

18-19. Notice of location should be filed as soon as possible in the public office of record of the district or county in which the location is made, but not necessarily at a United States Land Office. The latter is often too distant. Ninety days after location should be the limit for recording in the United States.

21-27. This organization strongly recommends and urges that the amount of the annual assessment work be set at $100 per claim or fraction thereof, as at present. Without extralateral rights this is sufficient; any larger sum would probably discourage prospecting.

All assessment work should be reckoned at the current wages of miners in the district.

Assessment work should be permitted upon one or more claims of a group of contiguous claims, provided that such work is so begun and continued as to constitute a development of the entire group.

If the amount of assessment work performed upon a single claim or fraction in a single year is in excess of $100, then the excess sum should be made a credit against the work to be done in the following year or years, at that rate, provided that no fraction of $50 be allowed.

If the amount of assessment work performed upon a group of contiguous claims or fractions of claims shall exceed a sum equal to the number of claims or fractions multiplied by 100, then the said excess should be made a credit against the work to be done in the following year or years, provided that no fractions of $100 be allowed.

In lieu of the performance of actual assessment work the owner should be permitted to pay into the office of record of the district (not necessarily a United States Land Office) the sum of $200 for each claim or fraction of a claim; and all sums so paid should be made a fund to be used in road building or in such other work as will better the mining conditions of the district in question.

All sums expended in the survey of claims should be counted as annual assessment work.

Any new law that is enacted should contain emphatic provisions that shall insure the honest performance of assessment work.

Every holder of a claim or fraction of a claim should be required to file an annual statement of his assessment work, and severe penalties should be imposed for the falsifying of these returns.

28-30. After careful scrutiny, existing patent regulations should be simplified wherever possible. Often at present they operate to cause vexatious delays. The question of monumenting groups, instead of claims, is open to debate, but it would seem best to monument each claim, as guides to an interested public, since some groups are very large. Absence of records in the recording office of the district should be the prima facie evidence of the nonexistence of conflicting claims.

31. This organization strongly urges the abolition of extralateral rights and hereby indorses Art. 5 of the memorandum of the New York Section of the Mining and Metallurgical Society of America.

32. Seven years after date of location, exclusive of time covered by pending adverse claims, is sufficient time for the payment and final entry.

33. Without question there should be granted the right of appeal from the decisions of the United States Land Office to a court of competent jurisdiction.

Ontario Mineral Production

The Bureau of Mines of Ontario has collected returns from the metalliferous mines and works of that province showing the production for the nine months ending Sept. 30, 1916. Following are the figures for the period and, for purposes of comparison, figures for the corresponding period of last year. It will be observed that there has been a large increase in the aggregate quantity, and also in the quantity of nearly all the individual products, due to causes mentioned in the notes appended.

SUMMARY OF ONTARIO MINERAL PRODUCTION FIRST NINE MONTHS OF 1916

Product	Quantity 1915	Quantity 1916
Cobalt (ore), tons	92	98
Cobalt oxide, lb.	135,337	378,732
Cobalt, metallic, lb.	76,979	172,055
Cobalt and nickel oxides (unseparated), lb.	2,501	57,026
Copper ore, tons		1,715
Copper in matte, tons	14,057	16,989
Gold, oz.	281,712	363,955
Iron ore, tons	302,586	271,034
Molybdenite (concentrates), lb.		15,845
Nickel, oxide, lb.	142,483	54,152
Nickel, metallic, lb.	11,905	17,435
Nickel in matte, tons	24,054	31,046
Pig iron, tons	354,153	501,410
Silver, oz.	17,178,629	16,203,091

The silver mines of the Cobalt district have definitely established their supremacy of the sources of the world's supply of this mineral. Notwithstanding the war which has closed the European markets, the shipments of cobalt oxides were much greater both in quantity and value, than in the first nine months of 1915. It will be observed that metallic cobalt is assuming an important place in the list. This is mainly due to its use in the manufacture of special alloys, principally stellite, for high-speed tools. Stellite is made of cobalt, chromium and tungsten and is finding a good demand from munition makers and other workers of modern hard steels.

The extraordinary rise in the price of copper, which averaged 27c. per lb. in New York during the nine months, has brought about the opening of several deposits of copper ore, chiefly west of Lake Superior, from which shipments have been made to British Columbia smelters. The most important of these mines is the Tip Top; another at Mine Centre has lately been shipping a carload of ore daily. The price received by the shippers has averaged 18.5c. per lb. for the copper contents. This figure has also been applied to the copper contained in the heavy shipments of matte from the Sudbury nickel-copper mines, and a considerable part of the increase in value of the copper is due to the higher valuation, although the quantity shipped was greater by 20%.

The gold output from the mines of northern Ontario is steadily increasing, being 28% in excess of that for the nine months of 1915. Hollinger Consolidated continues to be the chief producer, accounting for 47% of the total. Dome followed with 21% and McIntyre-Porcupine with 10%. The other considerable contributors in this camp are Porcupine Crown, Schumacher, Vipond and Jupiter, which together furnished 5.5%. Outside of Porcupine proper, Tough-Oakes yielded $519,149; Canadian Exploration, Crœsus and a small output from Dome Lake amounted to over $250,000. At Teck-Hughes (Kirkland

Lake) the mine has been developed and a mill built which will be put in operation as soon as the power-transmission line now being erected from Cobalt has been completed. Other prospects here—the Lake Shore, Wright-Hargrave, Kirkland Lake Gold Mines, La Belle-Kirkland and Sylvanite—are also being developed. This is a promising camp. In Gauthier township the Huronian mine is being worked under a lease. Several discoveries of gold were made during the summer in Benoit township, but there has not been time to prove their value. At Tashota, the Tash-Orn company has bought the Wells claim and has put in machinery to give it a thorough test. This company is also working the King-Dodds claims. A diamond drill has been operated on the Devanney, Reamsbottom and Clive claims.

There is a demand for molybdenite in Great Britain for making tool steel and several deposits of the ore in eastern Ontario have been opened and are being worked. There are dressing plants at Renfrew and Ottawa, the latter operated by the Dominion Mines Department. Ferro-molybdenum is also being made at Orillia and Belleville. The supply of molybdenite throughout the British Empire has been reserved as a war measure and a price of 105s. per unit fixed for concentrates delivered at Liverpool. This approximates $1 per lb. here.

The Canadian Copper Co. and the Mond Nickel Co. have been working their mines and smelteries at maximum capacity, and the output of nickel contained in the matte product of the furnaces for the nine months falls little short of that for the full year 1915. The production for 1916 will probably exceed that of 1915 by 20%. The valuation of the nickel in the matte has been increased from about 11c. per lb. (the figure adopted by the mining companies) in 1915 to 25c. per lb. in 1916. Nickel refineries are to be erected in Ontario by the International Nickel Co. and the British America Nickel Corporation, the latter of which is developing the Murray mine. Small quantities of metallic nickel are being produced from Cobalt ores by the Deloro Smelting and Refining Co.

The whole production of iron ore was from the Helen and Magpie mines of the Algoma Steel Corporation. At the latter the ore (siderite) is roasted previous to shipment. Four blast-furnace companies at Port Colborne, Sault Ste. Marie, Deseronto and Hamilton respectively, produced pig iron in quantity 41% greater than in the corresponding period of 1915.

The silver mines at Cobalt continue to produce, though on a slowly diminishing scale. The number of fine ounces contained in the shipments of the nine months was 975,538 below the record for the same period of last-year, but owing to the much higher prices that have prevailed for silver, the return to the mining companies was $1,719,571 greater. Silver started the year at 56.76c. per oz. and rose to a maximum in May of 74.27c. whence it receded to 63.06 in July, reaching 68.51c. again in September. In 1915 the monthly average was 49.75c. per oz. Nipissing still leads in production, Mining Corporation coming next, followed by Kerr Lake, Coniagas, McKinley-Darragh-Savage, Seneca-Superior, Temiskaming, etc. The flotation process is likely to assist materially in increasing the production of silver at Cobalt. It has been introduced at the Buffalo mine, where it is treating low-grade rock containing 5 or 6 oz. per ton. From the gold ores treated during the period 66,347 oz. of silver was obtained, and from the copper ores 607 oz.

Colorado Scientific Society on Mining-Law Revision

In response to the questionnaire[1] submitted by the Mining and Metallurgical Society of America to its own members and to other coöperating organizations of mining men, the Colorado Scientific Society made the following reply:

In arriving at their own members' report, the committee has given weight to the majority opinion among our membership, as indicated by replies received to the question-form mailed to members.

In view, however, of the obvious fact that the questions require special study of the subject, which many members cannot be expected to have given, and also to the apparent lack of appreciation on the part of some members of the exact meaning of the questions, your committee members have based their report on their own convictions, resulting from mature study and not entirely on the majority opinions, especially where the majority is not pronounced.

Question 3, as propounded by the Mining and Metallurgical Society, reads as follows: "Shall actual discovery of a valuable mineral deposit be necessary to a valid location of a claim?" This question has evidently been misunderstood by many members, as is shown by their replies to succeeding questions. A valid location, particularly if it may be maintained in force as a location for an indefinite period, is an absolute title, and if discovery were not required as a preliminary for such a location, it would be tantamount to abolishing the discovery requirement altogether. While, therefore, a large majority of our members answered the question in the negative, their replies to subsequent questions indicate that this is not what they intended. We are inclined to think questions 18 and 21 have also been imperfectly understood. It is perhaps inevitable that any set of questions drawn up as the present list was drawn would prove in some respect misleading and that some questions of importance should be left unasked.

The following conclusions of your committee refer by number to the specific questions submitted in the list:

1 and 2. Your committee, and the membership of your society, answer these questions in the affirmative.

3 and 4. Your committee has not found itself able to reach an agreement as to whether the discovery requirement should be waived entirely. A majority of the committee are unwilling to see the requirement abolished, but desire that actual possession of a delimited claim should be legalized pending bona fide effort to make discovery. There is general agreement that mineral locations should be permitted upon discovery on all public lands, whether officially classed as mineral or nonmineral.

5. Prospecting should be permitted, and the prospector protected, on land classified as nonmineral.

6 and 7. If location without discovery is permitted, patent should not be issued until discovery is made.

8. We see no merit in the suggestion that there should be a larger payment for land patented without discovery.

9. Your committee and the members of the society are evenly divided on the question whether one discovery should be sufficient for a group of contiguous claims under one ownership.

10 and 11. Your committee cannot agree as to area of claims. If the unit is made sufficiently small, they agree that there is some advantage in requiring claims to be rectangular, made of square units disposed in any form desired. Small claims, in the opinion of part of the committee, would be inadmissible unless an affirmative reply is given to question 9. No member of the committee favors a larger claim than 40 acres as a maximum, but some of the committee favor 2½-acre units with a maximum area of 20 acres, arranged as desired by the locator.

12. We consider it advisable that every claim should be independently monumented.

13 and 14. Your committee considers that the unsatisfactory condition of the public survey, the irregularity and unsatisfactory monumenting of existing sections in many localities and the difficulty of finding section corners without the assistance of a surveyor preclude the use of subdivisions of the public survey, however theoretically desirable this system might be.

It is desirable that all boundaries should be north-and-south and east-and-west.

[1]Questionnaire published in the "Engineering and Mining Journal," Oct. 14, 1916, p. 719.

15 and 16. There should be no limit to the number of claims any person or association is permitted to locate.

17. Existing regulations concerning the marking, notice and record of locations should be continued substantially as at present, but your committee thinks that the regulations should be revised and made more stringent, and that uniform Federal regulations should replace those of the individual states.

18, 19 and 27. It would seem that most of our members did not realize that this question implied a change in the place for record as well as the question of time for record.

Your committee is unanimously of opinion that the United States Land Office records should not be burdened with location certificates and affidavits of annual labor, in respect of claims the great majority of which are never patented.

Furthermore, the committe considers that the time allowed for record with the county recorder, in view of the improved facilities which now exist, might with advantage be shortened to 60 days.

20, 21 and 22. A majority of the replies to question 20 from our members is in the affirmative. A majority of your committee, however, prefers that the rate should be the same as that which has usually prevailed in Colorado; namely, $10 per acre.

It is thought not desirable to provide for a payment into the Land Office in lieu of the actual performance of assessment work on the ground.

23. The owner of a group of contiguous claims should be permitted to do the assessment work on one claim for the entire group, when the work performed benefits the group.

24. Your committee is emphatically of opinion that excess assessment work done in one year should not be credited to succeeding years.

25 and 26. Our members and the committee are unanimously of opinion that adequate provision should be made for the insuring of bona fide performance of annual assessment work.

In figuring its value, the cost of labor should be figured at the current rate in the district for a similar character of work.

27. Certificates of assessment work should be required annually, should specify the exact place and manner in which the work was performed, and should be filed in the office of the county recorder accompanied by vouchers or other corroborative evidence.

28 and 29. Proceedings for patent should remain substantially as now provided. We think that every claim should be monumented, and we incline to think it should be provided that every such monument should be visible from the next.

30. Your committee thinks it unadvisable to record locations in the Land Office at all, and it would therefore be inadmissible that absence of conflicting locations in the Land Office records should be taken as evidence that no conflicts exist.

31. Your committee approves the proposal for abolition of the extralateral right for future mineral claims, in the form proposed.

32. Your committee is unanimously of opinion that no requirement of patent within any fixed period should be exacted.

33. Your committee is unanimously of opinion that any new mining law should provide for appeal to the courts from decisions of the United States Land Office.

Export Duties on Metals in Peru

Peru is placing high duties on all metal exports, according to a law recently passed by Congress and summarized in a consular report. The tax on copper is based on a graduated scale. That is, when the price of standard copper in London is from £60 to £65 ($292 to $316) per ton, the export tax will be 15s. ($3.65) per ton of 1,016 kg. (2,240 lb.) Above £65 ($316) the tax will be 2s. (49c.) additional for every pound sterling increase in price. Not only does this measure seriously affect the exports of copper, but the gold and silver contained in the copper bars exported are also taxable.

Fine gold is taxed at £10 ($48.66) per kg. The gold contained in copper and other metals pays a tax of £2 ($9.73) per kg. Silver is subject to a tax of 1s. per kg., when the price in London is quoted at 23½d. a troy ounce; above this price, 2½d. (5c.) more for each penny increase.

Petroleum pays a contribution of only 1s. a metric ton. These taxes are required to be paid in drafts on New York or London at 90 days' sight. When the tax amounts to less than £40 ($194.66), it may be paid in English gold. The Chamber of Commerce of Lima fixes weekly the value per ton of standard copper and of the troy ounce of silver, being guided by the price quoted by the London Metal Exchange.

In addition to this export law, another measure was passed by Congres, which places customs duties on all imports of mining machinery, which heretofore, was free of duty.

At the present time (June, 1916) the producers of copper are paying the government on an average of about £7 ($34) for every ton of standard copper exported from the country. It is said that under the new law the Cerro de Pasco Mining Co. will have to pay over $1,000,000 yearly.

Day Holdings in Hercules Mine

WALLACE CORRESPONDENCE

The story of the Hercules mine, how it made millionaires out of a group of poor men and incidentally transformed a notorious labor agitator into a peaceful and conservative citizen, has been told and retold until it is known to all who are familiar with the mining industry of the West. A new chapter to the fascinating story was announced in the *Journal* last week, a deed having recently been filed in the office of the county recorder transferring a one-sixteenth interest in the Hercules from Mathilde Cardoner to Eleanor Day Boyce. Mathilde Cardoner is the widow and heir of the late Damian Cardoner, who died about a year and a half ago at his home in Barcelona, Spain. The acquisition of this interest gives the Day family ownership of a little more than half of the bonanza mine and makes Mrs. Boyce the largest individual owner except August Paulsen, who owns a little more than one-fourth. The Hercules is a partnership concern, but there is more secrecy about its affairs than is maintained by the closest corporation. The county records, however, show how the ownership is distributed, and the shareholders are here given, the fractional interests being reduced to the smallest common denominator:

Harry L. Day, Wallace	4/64	August Paulsen, Spokane	16/64
Jerome J. Day, Moscow	2/64	L. W. Hutton, Spokane	2/64
Eugene R. Day, Wallace	4/64	F. M. Rothrock, Spokane	2/64
Mrs. Eleanor Day Boyce, Portland	4/64	Markwell family, Los Angeles	4/64
Mrs. Blanche Day Ellis, Portland	2/64		

The purchase of the Cardoner interest by Mrs. Boyce gives the Day family thirty-three sixty-fourths of the Hercules property. The consideration given in the deed is $1, and the real price paid is purely a matter of conjecture. When the will of the late Damian Cardoner was filed for probate, the interest was appraised at $250,000. It is assumed that the one-sixteenth brought not less than half a million dollars and possibly more. The mine is paying from two and a half to three millions a year.

At the time the bonanza strike was made in the Hercules, Damian Cardoner, a native of Spain, was the owner of a small general merchandise store in Burke, and he acquired his interest in the property from Harry Orchard, who is now serving a life sentence in the Idaho penitentiary for the murder of Governor Steunenberg. Orchard's confession implicated the heads of the Western Federation of Miners, who were arrested in Denver and

brought to Boise, where their trial attracted national attention. The conveyance of the Cardoner interest to Mrs. Boyce and the fact that it was originally owned by Harry Orchard recalls some rather ancient but nevertheless interesting history in connection with early labor troubles in the mining districts of the West. In his confession giving the details of his murderous career. Harry Orchard asserted that he was employed by the Western Federation of Miners, and there are few who read his story and followed the trial of the Federation officers who doubt that he told the truth. But be that as it may, the significant fact now recalled is that the organization of the Western Federation of Miners was the outgrowth of the labor riots in the Cœur d'Alene district in 1892, in which Edward Boyce, husband of the purchaser of the Cardoner interest, was one of the conspicuous figures; that it was largely through his efforts that the Western Federation was organized, and that he was its first president. Seldom have the changes wrought by time presented a more striking spectacle. Harry Orchard, the tool of the Western Federation of Miners, is paying the penalty of his crimes behind prison walls, while Edward Boyce, the organizer of the Western Federation and for years its guiding spirit, comes into possession of the vast wealth which was once Orchard's and which might have been his now had he been touched by a more kindly fate when he peddled milk to the miners of Cañon Creek along with the more thrifty August Paulsen.

New Mining-Experiment Station

WASHINGTON CORRESPONDENCE

Seattle, Wash., will be the site of the Northwest mining-experiment station. The Secretary of the Interior on last Thursday announced that he approves the recommendation to this effect made by Van H. Manning, director of the Bureau of Mines. After having heard the arguments in favor of the various points contending for this station, it was concluded that Seattle is the most available. Since some opposition to the selection has sprung up, Director Manning has pointed out how careful and systematic was the investigation that resulted in the selection of Seattle. In this connection Mr. Manning said:

"All the data collected upon the trip were carefully weighed and all the respective claims presented by the different localities were considered. The various needs of the whole region under consideration especially in regard to interrelationship of its various parts, were modified and broadened by this careful study of the representations made by those best acquainted with the industry in each center.

"It has not been an easy matter to make a final decision on the location of the station, and even now the final decision is to a large extent based upon assumption as to the future policy with regard to the location of other stations and the extension of less formal coöperation to other existing institutions in the general region under consideration.

"As the result of careful consideration of the data collected regarding the problems to be undertaken and the facilities and coöperation offered in each case, I felt impelled to recommend that the station be established at Seattle, Wash., in coöperation with the University of Washington, and that work also be carried on in coöperation with the University of Idaho and the Oregon State Bureau of Mines. The station will be able to handle problems not provided for at the other stations by coöperative work, and will take care of the problems met with along the southwestern and southeastern coasts of Alaska. Moreover, by locating the station at Seattle, it will be possible to lay special emphasis upon electrometallurgical work, which is a matter of great importance to the northwestern part of the United States and to all the Alaskan coast as well."

The station in the Southwest and the one in western Alaska were agreed upon without controversy. In the Northwest, however, great difference of opinion among mining men as to the best point for the station early became evident. This resulted in Mr. Lane's sending Director Manning to make a personal investigation. Mr. Manning was accompanied by F. G. Cottrell, chief metallurgist of the Bureau of Mines, and Dorsey A. Lyon, who is to be in charge of the Northwestern station. This board was unanimous in its opinion that the station should go to Seattle.

Importance of Magnesium

WASHINGTON CORRESPONDENCE

Possibilities favor a great increase in the importance of magnesium mining, according to Frank L. Hess, the specialist of the Geological Survey who is in charge of the lesser used metals. Since the opening of the war a considerable production of this metal has resulted, and according to Mr. Hess the magnesium made in this country is considerably better than that formerly imported from Germany. The General Electric Co. is the most important producer, but the Norton Laboratories and the Electric Reduction Co. also have a considerable output.

Mr. Hess says that the properties of magnesium, and especially of its alloys, are not sufficiently well understood to permit of an exact forecast of the coming importance of this metal. He is very much impressed, however, with the attractive possibilities that are likely to come with the alloying of magnesium with some minor constituents, like the carbon in steel, which will improve its hardness, tensile strength and elasticity.

Investigations by the Geological Survey disclose that some, who are experimenting with magnesium, believe that the metal can be produced in large quantities at a cost as low as 15 cents. An important manufacturer, however, is of the opinion that technical difficulties in production will keep the cost considerably higher.

Ferroalloys from Germam Slags

An invention that may have some bearing on one phase of Germany's manganese supply is found in a patent (U. S. 1,196,185, Aug. 29, 1916) recently granted to Friedrich von Holt, of Georgsmarienhütte, Germany, according to *Iron Age*, Nov. 16, 1916.

Taking furnace slags, comparatively low in phosphorus and often containing manganese, the inventor makes a specular iron rich in phosphorus, which he suggests can be used in making steel as a substitute for the usual additions, introducing the required amount of manganese and phosphorus for certain steels and producing ferrophosphorus directly, if little manganese is present.

The phosphatic slag is added to the charge of a gas producer. According to the inventor, the heat causes the basic constituents of the slag to combine with the silicates of the ash, while the phosphorus forms with the iron the desired ferrophosphorus. The operation of the producer is not unfavorably affected, it is claimed. High manganese slags, it is stated, produce the specular iron rich in phosphorus.

Australian Zinc Production*

During the year 1915 the mines of the Broken Hill division produced a total of 1,504,603 tons of ore, of which 47,025 tons was oxidized ore and the remainder sulphide. While this is a gain over the 1914 total of 1,441,966 tons, it is still a considerable decrease from the 1913 maximum of 1,744,177 tons. In 1913 the production of oxide ore was only 27,876 tons, compared with 92,970 tons in 1914 and the before-mentioned 47,025 tons in 1915.

Owing to war conditions the British, Junction North, Junction Lead, and Block 10 mines were closed down throughout the year, and employed a total of only 135 men as against 1,907 in the year 1914.

The companies engaged in treating zinc tailings piles produced a total of only 190,916 tons of concentrates, compared with 359,310 tons in 1914 and 506,661 tons in 1913.

The Broken Hill Proprietary Co.'s flotation plant treated 280,867 tons, of tailings, producing 69,985 tons of zinc concentrates assaying 46.54% zinc, 6.41% lead, and 12.79 oz. silver per ton.

The Sulphide Corporation put its new zinc plant into commission in October and closed down the old plant after a run of 9 years. The new plant consists of a long series of flotation mixers of special design with underhand belt drive in lieu of overhead bevel gear. The plant is so arranged that the early mixers discharge high-grade lead concentrates, while the later machines produce a zinc concentrate.

The Amalgamated Zinc plant treated 317,239 tons of tailings whose average assay value was: Zinc, 16.8%; silver 3.5 oz.; lead, 3.2%. The production of zinc concentrates totaled 91,663 tons whose average assay was: Zinc, 49.2%; silver, 7.9 oz.; lead, 5.7%.

The production of lead concentrates was 1,130 tons whose average assay was: Zinc, 11.5%; silver, 51.8 oz.; lead, 57.6%. The estimated value of the 1915 production was £525,212; no dividends were paid.

The Zinc Corporation plant did not run during 1915, having been shut down at the outbreak of the war in August, 1914.

Mining Future of Yerranderie*

The Yerranderie Division is included within the Southern Mining District of New South Wales, Australia. It has been regarded by mining men for some time as one of the most promising mining districts in the state. Last year is was recorded that the mining population of Yerranderie had decreased considerably, no new mines had been opened, very little prospecting had been undertaken, and all the small "shows" had closed down. The reasons advanced were the isolation of the field from the railway system, the state of the connecting road, the extremely heavy haulage charges and the exhaustion, to a large extent, of the richer ores as the workings of the old mines had extended.

Making allowance for the abnormal conditions arising from the war, there has not been any appreciable change during 1915. The future of the field is clearly dependent upon two factors—the construction of a railway so as to enable the immense deposits of second-grade ore to be treated economically and the proving of fresh deposits by way of extension of the existing field. It is hoped that the present inquiry by the Public Works Committee will result in the satisfaction of the first requirement and that the construction of a line of railway from Picton Lakes will eventuate in the near future. As to the second, the recent discoveries in the Peaks Silver and Lead Co.'s leases have gone a long way toward establishing what was considered a moot point, namely, a southwesterly extension of the rich ore zones encountered in the parent mines.

It is worthy of remark in this connection that the government has largely helped to prove the resources of the field, as the Peak Silver and Lead Co. has been assisted by grants from the prospecting vote, while P. Coffey's leases on the western edge of the present titles have been tested by bores under government supervision and are considered to be promising "shows." While the developments that have taken place will in a measure assist in maintaining, perhaps improving, the output, the crying need is the railway, which, besides materially reducing working costs, would encourage legitimate prospecting and expansion.

*Abstract from Annual Report of Department of Mines, New South Wales, 1915.

Alaska Placer-Mining Locations

By A. L. H. Street*

Under a recent decision of the United States Circuit Court of Appeals for the Ninth Circuit, a location of a placer-mining claim in Alaska by one person for another is void, unless there was previously recorded a power of attorney authorizing the location (Sutherland vs. Purdy, 23 Federal Reporter, 600). The decision is grounded upon the acts of Congress governing mining in Alaska, the court saying:

> Whatever the reasons that caused Congress to prescribe conditions in regard to the location of such claims in Alaska essentially different from those applicable to other portions of the country, its language is, we think, perfectly clear and unmistakable and of course must be taken to mean what it says.

The Gold Yield of Queensland for August was 20,433 fine oz., of the value of £86,794, this being a decrease, when compared with the corresponding month of last year, of 1,501 oz. in quantity and £6,376 in value. The returns from Croydon showed an increase of 375 oz., and from Gympie of 965 oz., while there was also a small improvement at Chillagoe. On the other hand, there were decreases—at Charters Towers of 1,063 oz.; Cloncurry, 616 oz.; Etheridge, 185 oz.; Clermont, 396 oz.; Mount Morgan, 933 oz.; and Ravenswood, 90 oz. The dividends declared by gold-mining companies for the month totaled £3,750, and for the eight expired months of the year £177,558, the latter amount being an increase of £49,393 over that for the corresponding period of last year. The yield of gold for the eight months was 157,381 oz., of the value of £668,512, or a decrease, compared with the return for the corresponding period of 1915, of 14,086 oz. in quantity and £59,833 in value.

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Editorials

Statistical Position of Spelter

During the first six months of 1916 the American production of spelter was officially reported as having been 316,000 tons, giving an average of about 53,000 tons per month. The smelting capacity had been steadily increased during the period, and at the mid-year there were reported an aggregate of about 194,000 retorts, with 22,000 building or contemplated, giving a total prospective capacity of about 216,000 retorts.

At the present time it is reliably reported that about 220,000 retorts are ready for operation, and judging from actual results that are available, the United States is in a position to make spelter at the rate of 770,000 tons per annum. Assuming that 95% of the capacity is in use, we get an annual rate of about 731,000 tons, or about 61,000 tons per month. In addition to that we are already producing electrolytic spelter at the rate of not less than 2,500 tons per month, the product of the Anaconda company, which is putting its several units into operation one by one and has not yet attained its full scale of operations. The present American production of spelter is therefore about 64,500 tons per month. Whither is all this spelter going? And why should the spelter market lately have been so strong?

Before attempting to account for the disposition of the present production of spelter, let us try to account for what became of the output in the first six months of 1916. The production during that period, officially reported, was 316,255 tons. The exports were 78,204 tons. The domestic deliveries were 228,700 tons. Domestic deliveries averaged 38,000 tons and exports 13,000 tons per month, a total of 51,000 tons per month.

In accounting for the use of this spelter, there is available certain definite information, but to a considerable extent we must depend upon conjecture. We have definite information respecting the exports of spelter and of brass in bars and plates. Manufactures of brass exported are also reported, but only in terms of value. We may compute approximately the quantity by dividing by the average price for brass plus an advance representing manufacture. Let us add 10c. per lb., which is probably a low figure. We can approximate the consumption for galvanizing and sheet zinc from information communicated by the galvanizers and rollers. As to brass for domestic peaceful purposes, the figure must be chiefly conjecture. Before the war it used to be 20 to 25% of the total consumption of spelter, the latter being about 300,000 tons per annum. Reckoning 25% of 300,000, we get 7,500. Our estimated distribution of the monthly delivery of spelter in the first half of 1916 is as follows:

	Tons
Exports	13,000
Galvanizing	13,000
Sheet	4,000
Domestic brass	7,500
Brass exported in bars, etc	3,000
Brass manufactures exported	7,200
Lead desilverization	400
Castings, etc	1,250
Unaccounted for	1,650
Total	51,000

Since the middle of the year two very striking things have occurred—the exports of spelter in slabs, etc., have increased to about 16,000 tons per month, while the exports of brass manufactures have increased to a probable 12,200. We state these figures on the basis of the average monthly exportation during the third quarter. The exportation of brass bars declined slightly. Employing these figures, together with those for other uses at the same rate as in the first semester, we get a probable delivery and distribution per month at the present time approximately as follows:

	Tons
Exports	16,000
Galvanizing	13,000
Sheet	4,000
Domestic brass	7,500
Brass exported in bars, etc	3,000
Brass manufactures exported	12,200
Lead desilverization	400
Castings, etc	1,250
Unaccounted for	1,650
Total	58,800

It is to be remarked that one kind of present consumption cannot be accounted for quantitatively; namely, the brass that goes into cartridges, the exportation of which is reported under the heading of "Explosives," and as the finished article in terms of value only.

Our estimate of spelter for brass manufacture totals 22,500 tons per month, corresponding with 45,000 tons, or 90,000,000 lb. of copper, which is just about what authorities in the copper trade estimate for the total copper delivery to brass manufacturers at present.

In this statistical study we disregard the position of spelter derived from scrap and waste products. Accumulations thereof probably were completely drawn into the market long ago, and the present production doubtless represents only the quantity that is constantly going round and round; that is, the galvanizer buys spelter, loses a part of it in dross, which is reworked by the dross smelter and by him is returned to the market.

At the present time we cannot draw very close deductions from any statistics. Many conditions are too much confused. The difference, in time with which individual figures are correlated is in itself an element of uncertainty, especially at present. Closely connected with that is the effect of the railway embargoes and the stocks that manufacturers are carrying in their yards. Such stocks have probably been much larger this year than in ordinary times.

We can get but some glimmerings of ideas. Stocks in the hands of producers accumulated to the extent of about 10,000 tons from Jan. 1 to July 1. While production was increasing during that period, the maximum has but now been reached. Since July 1 there has been a great increase in consumption for brass-making, which increase must at one time have outstepped the increase in production, and even may have diminished the stock. The behavior of the market reflects something of that sort, which may have happened a couple of months ago.

Now production is forging ahead, swelled by the advent of the Anaconda spelter and, although likely to be checked slightly by cold-weather troubles in the natural-

gas districts, is probably on the point of outstepping consumption unless the latter advances beyond what the figures for the third quarter indicate.

Respecting Munitions Contracts

It was announced last week that the Remington, Westinghouse and Midvale companies have compromised their rifle contracts with the British government. The number is cut down from 3,500,000 to 2,000,000, which are to be delivered at cost, plus reimbursement for the plant installed to make them. A year and a half ago people were all agog over the immense rifle contracts that were being placed. Every owner of a reasonably equipped machine shop wanted to get such a contract and begin making rifles. Later it developed that even so experienced a concern as the Remington was having trouble. The others appear also to have had trouble. Now they consider themselves lucky to get out of their contracts with a whole skin. This is a chapter in the history of American manufacturing wherein we cannot feel any pride.

If we may rely upon the gossip that is printed on the financial pages of the daily papers, some of the shrewd managers of rifle-manufacturing companies sold out their stock at high prices when the market capitalized expectations. Thus they got all that they hoped, and the disappointment falls on the later stockholders.

The experience of the rifle-manufacturing companies is not the only case of disappearance of expectations of large profits. There are others that have had to put great sums of money into plants and have incurred losses in doing so. We have no doubt that many big surpluses will eventually turn out to be largely in bricks and mortar, which may not be wanted for any useful purpose.

The Rise of Steel Products

Steel has long been considered the index of general prosperity. If that is true now, the country must be considered prosperous indeed. Steel prices are high and are still advancing. The high level seems to be no brake upon further advances and buying is still heavy, advances in basic prices seeming to merely punctuate increasing consumption. The auxiliary companies of the Steel Corporation have been backward in taking advantage of maximum rates, but they have been compelled, at last, to fall into line and in some cases have made leaders of themselves. The demand for steel products, both for domestic consumption and for export, continues exceedingly great, finished and crude steel continuing to share in the demand and price increases.

It appears that the Entente Allies are going to depend less upon American shops for finished products in the future, for orders for shell steel in crude form have been more abundant for export. It is noted in the trade that J. P. Morgan & Co. has contracted for about 1,500,000 tons of blooms and other forms of crude steel for delivery during the last half of 1917. This tonnage has been placed in various mills, so that many will share in the benefits. The price at which this order is said to have been placed ranges between 4 and 4.25c., while the same kind of material for first-half delivery was sold at from 3 to 3.5c. at mill.

The European order will call for a great part of the available output of material of the kind, and is likely to lead to higher prices than those now prevailing. The steel will, according to advices, be rolled and machined at European mills. No doubt there will be further purchases of steel products for second-half delivery, but it is not likely that any orders approximating this one in magnitude will be seen.

The activity is not all due to foreign orders, though, for there is brisk demand and large consumption inside the country. Shipbuilding interests are particularly large consumers, both for actual ship construction and also for material extensions to their plants. The New York Shipbuilding Co. and the Newport News Shipbuilding and Drydock Co. have placed large orders for purposes of plant extension. Car builders and structural-material shops are also placing orders of great aggregate amounts, and rail mills are said to be exceptionally busy. Taking it altogether, the index is pointing to a record mark, and industry in practically all the other metals is correspondingly great.

The Mexican Agreement

The daily press has been giving a great deal of space lately to a discussion of the terms of the latest agreement between Washington and the Carranza Government. We consider, naturally, that anything that will lead to a permanent arrangement for real settlement of disputes and a discontinuation of the sport of killing foreigners in Mexico will be a good thing, but we hope to be pardoned for withholding a belief in the efficacy of any treaty, no matter how many signatures it carries, while the impotence of the Carranza government in Mexico is so clear.

At the very moment the agreement is being considered a battle is reported to be in progress near Chihuahua, Villa forces attacking and Carranza forces defending the town. It would seem to be the natural thing for the Carranzistas to do, if they feel able, to continue their attacks upon the Villistas until they are completely defeated or dispersed. This, however, has not been the plan. On the contrary, Villa attacks—he is repulsed—he camps near Chihuahua—he attacks again—is again repulsed. Between each attack the Villistas refresh themselves, while at the same time the Carranza army returns to the city and accumulates *tortillas* and *frijoles* and then, after a little *siesta,* is ready for another battle. At this rate the difficulty will continue to the end of time, and what is the use of the written agreement? If the Carranza government cannot take care of itself, how is it going to protect anybody else?

There have been numerous stories respecting that copper consolidation, ranging from the pronouncement that it was 0.5% fact and 99.5% fancy to the wise but mysterious "Oh, there was really something in it, but it was disclosed prematurely." Anyway, talk simmered down to its being probably a consolidation only of Chile and Kennecott, to which Utah was added by some. The union of Utah with them would look like an unholy plural marriage. Utah has gone through the fire of criticism and has come out a seasoned investment stock, held widely for the sake of its dividends. Chile and Kennecott are big companies and new ones, whereof distribution has not yet taken place, at least not widely. Just before the week of the boom in copper, the tip on those stocks was widely circulated. Then the rumor of consolidation was

sprung. During the following week both stocks declined sharply on heavy selling. Probably a good many people became stockholders of Kennecott and Chile near the top of the market who did not intend to be permanent ones, but may find that they are.

BY THE WAY

A dispatch to the New York *Evening Post,* from Montreal, points out that with reference to the endeavors made by some leading American bankers to create sentiment in investment circles favorable to British and French loans unsecured by collateral, it is taken as being the results of intimations from the British authorities to the effect that unless such loans are granted, continuance of the excessive shipments of gold will be necessary. In view of the exceptionally large stocks of gold controlled by the three leading Powers of the quadruple Entente and of the large monthly production of mines in British territory, it is believed that London could without undue effort continue to send gold in even greater quantities—this without dangerously weakening the specie basis of the British and French currency issues.

Charles M. Schwab, of Bethlehem Steel fame, tells about his 20,000 partners in the *American Magazine.* In telling how he increased the efficiency of one of his departments, he says:

It was near the end of the day; in a few minutes the night force would come on duty. I turned to a workman who was standing beside one of the red-mouthed furnaces and asked him for a piece of chalk.

"How many heats has your shift made today?" I queried.

"Six," he replied.

I chalked a big "6" on the floor and passed along without another word. When the night shift came in they saw the "6" and asked about it.

"The big boss was in here today," said the day men. "He asked us how many heats we had made, and we told him six. He chalked it down.

The next morning I passed through the same mill. I saw that the "6" had been rubbed out and a big "7" written instead. The night shift had announced itself. That night I went back. The "7" had been erased and a "10" swaggered in its place. The day force recognized no superiors. Thus a fine competition was started, and it went on until this mill, formerly the poorest producer, was turning out more than any other mill in the plant.

In a report on the "Exploration of the Valley of the Amazon" (thirty-second Congress, Second Session, Senate, Executive Document No. 36, 1853), Lieut. William Lewis Herndon gave a brief but interesting account of mining in the Morococha district of Peru, in which he sojourned for a short time while en route for the headwaters of the Amazon. Shortly after passing Chiglla and Bella Vista, he chanced to meet on the road an old schoolmate, whom he had not seen or heard of since they were boys. This friend, Shepherd, was the engineer and head machinist of the mines at Morocoha. Herndon continues:

We arrived at Morococha at 5 p.m. This is a copper-mining hacienda, belonging to some German brothers named Pflucker, of Lima, who own also several silver mines of the neighborhood. The copper and silver of these mountains are intimately mixed; they are both got out by smelting; though this operation, as far as regarded the silver, had been abandoned and they were now beginning the process of extracting the silver by the mode of grinding and washing, after having tried the via humida (or method of washing in barrels, used in Saxony) and failed.

The copper ore is calcined in the open air, in piles consisting of alternate layers of ore and coal, which burn for a month. The ore thus calcined is taken to ovens built of brick imported from the United States, and sufficient heat is employed to melt the copper, which runs off into molds below; the scoria being continually drawn off with long iron hoes. The copper in this state is called exe; it has about 50% of pure copper, the residue being silver, iron, etc. It is worth 15c. per lb. in England, where it is refined. There is a mine of fine coal 18 mi. from the hacienda, which yields an abundant supply. It is bituminous, but hard and of great brilliancy.

The hacienda employs about 100 hands; more are desired, but they cannot be had at this time, because it is harvest and the Indians are gathering the corn, barley and beans of the valleys below. A man will get out about 1,000 lb. of copper ore in a day. I do not think the mines were at work during our stay; at least, I saw or heard nothing of them. I could not either get statistics concerning the yield of these mines or the cost of working them, and I thought that I noticed some reserve on this subject.

We receive many prospectuses, but of them all, we think this one holds the record:

PROSPECTUS

THE THREE BUTTES AND CONSUMNES COPPER MINES

Embracing 30 square miles in extent. Largest copper deposit in the United States. Perhaps in the world.

Vast mountain ranges of copper, gold, silver, antimony, molybdenite and iron.

Huge deposits alunite slate rich in potash salts.

Large deposits crystalline marble, best statuary and building stone.

All material exist on this property for the manufacture of cement and lime on an extensive scale.

A giant low-grade ore proposition. One thousand million tons of ore in sight.

Copper ores of pyrite, chalcopyrite and tetrahedrite.

Two rivers and two large creeks flow thru this property. Furnishing an abundance of water power for the generation of all sorts of electric power.

Huge gorges cut in remote ages by the present streams reveal the extent of this giant deposit and its wondrous formation.

A great per cent. of this property owing to the steep precipitous mountain sides can easily be mined by side hill quarry and electric shovel.

The Diamond and Caldor R.R. cuts thru the southern end of this property.

75 miles in a direct line to tidewater.

Easy access by wagon road and railroad.

3,000 to 4,000 ft. above sea level.

Situated in El Dorado County, Calif. and in townships 9 & 10 north and ranges 13 east, M. D. M. and in latitude about 30 degrees 40 minutes north and in longitude 120 degrees and 33 minutes west.

Five hundred million feet of the highest grade merchantable saw timber of sugar pine, yellow pine, spruce, cedar and fir.

About one million dollars worth of development work has been done. Mostly for gold.

This property is large enough for several large companies to operate for hundreds of years.

A full detailed report will be sent to all interested parties. Also representative samples of the ore.

S. L. WATKINS.

Pleasant Valley, El Dorado Co., Calif.

We really don't care so much for gold now, for we are getting plenty of that from Europe. Everybody is anxious, however, to secure more potash, statuary marble, cement, antimony, molybdenum, and some of the other things that are in this horn of plenty. Surely this is our chance!

Personals

C. M. Weld returned to New York from Cuba on Nov. 27.

J. V. Richards, of Spokane, has gone to California to report on mines on the Mother Lode.

C. D. Kaeding has changed his address from South Porcupine, Ont., to Riverside Hotel, Reno, Nev.

J. H. Lang, of Vogelstein & Co., 42 Broadway, New York, returned on Nov. 17 from a trip to Europe.

Charles F. Willis, director of the Arizona Bureau of Mines, was a visitor at Washington, D. C., last week.

Dr. J. K. Clement served as director of the Bureau of Mines during the absence of Director Manning last week.

Karl L. Kithil, who had been named to take charge of the Bureau of Mines experiment station at Tucson, Ariz., has resigned.

George Otis Smith, director of the United States Geological Survey, has returned to Washington after an absence of two weeks.

E. V. Neelands has resigned as general manager of the British Guiana Gold Concessions Co., Ltd., and has returned to Canada.

J. R. Holcomb has been appointed superintendent of the Wilmington Steel Co., by President A. C. Dinkey, to succeed W. J. Stoop, resigned.

V. F. Marsters, geologist for the New York & Honduras Rosario Mining Co., has returned to the United States. He is at present at Rushville, Ind.

F. G. Cottrell, chief metallurgist of the Bureau of Mines, is expected at Washington on Dec. 8. He has been on an extended trip through the West.

Prof. Francis A. Thomson has recently been engaged in making an examination of quartz properties near Pierce City, Idaho, for New York interests.

Dr. John A. Brashear, Pittsburgh, together with Ambrose Swasey, of the Warner & Swasey Co., Cleveland, sailed for China, from Vancouver, B. C., Nov. 24.

Roy R. Horner has been named to take charge of investigation of metal-mining methods for the Bureau of Mines. His headquarters will be at Salt Lake City.

Henry F. Collins has resigned the executive management of the Huelva Copper and Sulphur Mines, and has accepted the position of consulting engineer to the company.

Stanley C. Bullock, who returned to England from Chile last year to enlist and is now serving at the front, has received promotion to the rank of captain in the Royal Engineers.

Jesse Scobey, managing director of the La Luz and Los Angeles Mining Co., arrived at Bluefields, Nicaragua, on Nov. 2, and left for Prinsapolka on Nov. 4, on a visit of inspection.

Frank R. Corwin has resigned as assistant superintendent of the Consolidated Arizona Smelting Co., to accept a position as assistant superintendent of the International Smelting Co., at Miami, Ariz.

Van. H. Manning, director of the Bureau of Mines, was in New York last week in consultation with Dr. L. D. Ricketts and John Hays Hammond regarding matters coming before the Anaconda Smelter Commission.

John A. Davis, head of the mining experiment station at Fairbanks, is on his way from Alaska to Washington, D. C., to confer with Director Manning, of the Bureau of Mines, in regard to the work of the station.

Lewis R. Ferguson, of the Portland Cement Association, is accompanying R. J. Wig, of the United States Bureau of Standards, on a trip along the Atlantic and Pacific coasts for the purpose of examining various concrete structures exposed to sea water.

R. S. Foster, safety engineer for the Butte mines of the Anaconda Copper Mining Co., has resigned to take a similar position with the Doe Run Lead Co. at Flat River, Mo. Mr. Foster will be succeeded by T. Oaas, formerly assistant safety engineer and C. E. Calvert, formerly shiftboss at the Berkeley mine, has been named assistant safety engineer.

Obituary

Franklin Morey, father-in-law of Clarence H. Howard, president of the Commonwealth Steel Co., died of pneumonia at the family residence, 5501 Chamberlain Ave., St. Louis, Mo. He was 85 years old and a mining engineer by profession.

He was known, moreover, as having been the first man to exhibit an arclight in New York. At a time when this form of electric lighting was considered impracticable, he went to New York, displayed his invention with the old and imperfect carbon, and carried his point. It was conceded at once that he had a valuable invention. Developments since have resulted in the present perfection of electric lighting.

Morey was born in Rome, N. Y., and went to Denver more than sixty years ago. He arrived there early in 1856. He returned to Missouri just before the outbreak of the civil war and organized a company in St. Louis that was held in reserve until the trouble ended.

He is survived by a daughter, Mrs. Clarence H. Howard, and by two sons, Frank L. Morey, secretary of the Commonwealth Steel Co., and Arthur T .Morey, one of the managers of that concern.

Societies

Engineers' Society of Western Pennsylvania—The regular monthly meeting of the society will be held in the society rooms, Oliver Building, Pittsburgh, on Tuesday, Nov. 21, 1916.

American Society of Mechanical Engineers will hold its annual meeting at the Engineering Societies Building, 29 West 39th St., New York, on Dec. 5 to 8, 1916. A varied and interesting program, particularly in technical papers, has been prepared.

Metallurgical Society of Missouri School of Mines.—The Metallurgical Society effected a permanent organization, Nov. 14, 1916. The following officers were elected: T. P. F. Walsh, president; H. A. Horner, vice-president; and C. L. Epperson, secretary-treasurer. An executive committee, consisting of professors Mann and Clayton, Horner, Epperson, and T. P. F. Walsh, chairman, was elected to draft a constitution and make all necessary arrangements for a successful year. The society, meeting every two weeks, intends to devote its time to metallurgy, ore dressing and chemistry.

The American Association for the Advancement of Science and about forty national scientific societies affiliated with it will meet in New York City from Dec. 26 to 30, 1916, under the auspices of Columbia University, New York University, the College of the City of New York, the American Museum of Natural History and the other scientific and educational institutions of the city. Dr. Charles R. Van Hise, president of the University of Wisconsin, will preside. The address of the retiring president will be given by Dr. William Wallace Campbell, director of the Lick Observatory. The executive committee consists of Henry F. Osborn, chairman; J. J. Stevenson, M. I. Pupin, Charles Baskerville, N. L. Britton, Simon Flexner, E. B. Wilson and J. McKeen Cattell, secretary.

Industrial News

The Lidgerwood Manufacturing Co., of New York, has opened a branch office in the Hibernian Building, Los Angeles, Calif. Charles A. Baechtold will be in charge of this office.

The Layne & Bowler Corporation, of Los Angeles, Calif., has recently sold to the Joplin Peacock Zinc Corporation, of Joplin, Mo., a high capacity pump for the dewatering of their mine, the pump is equipped with a special oil-bearing thrust for carrying the weight of the long line of the shaft. A. E. Bendelari, of Picher, Okla., has also bought from this company a large turbine centrifugal pump for dewatering his mine, the pump has a capacity of lifting 2,000 gal. per min. from a depth of nearly 300 ft. below the head of the shaft.

Trade Catalogs

Plymouth Gasoline Locomotives. The J. D. Fate Co., Plymouth, Ohio. Catalog No. 3; pp. 96; 6x9 in.; illustrated.

Crude and Fuel Oil Burners. Schurs Oil Burner Co., Los Angeles, Calif. Catalog No. 8. Pp. 56; 6x9 in.; illustrated.

Ingersoll-Rogler Air Compressors. Ingersoll-Rand Co., 11 Broadway, New York. Form No. 3130; pp. 24; 6x9 in.; illustrated.

Little David Pneumatic Riveting Hammers. Ingersoll-Rand Co., 11 Broadway, New York. Form No. 8311; pp. 16; 6x9 in.; illustrated.

Water Controlling Apparatus. Rodney Hunt Machine Co., Orange, Mass. Catalog No. 30; pp. 112; 6x9 in.; illustrated. Flumes, stand pipes, gates, valves, etc., made by this company are shown.

Vasco Vanadium Steel. Vanadium-Alloys Steel Co., Pittsburgh, Penn. Folder describing various types of this steel and containing information as to the study of alloy steels in general and uses of same.

Gold Dredges. The Yuba Construction Co., 433 California St., San Francisco, Calif. Catalog; pp. 28; 9x12 in.; illustrated. This shows photographs of dredges constructed by this company and which are now operating.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Concentrator. Everett Richard Shahan, St. Paul, Minn. (U. S. No. 1,205,673; Nov. 21, 1916.)

Crushing. Grinding or Pulverizing Machinery. George H. Fraser, New York, N. Y. (U. S. No. 1,205,613; Nov. 21, 1916.)

Crushing Roll. Ray C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Manufacturing Co., Milwaukee, Wis. (U. S. No. 1,205,474; Nov. 21, 1916.)

Drill—Pneumatic Hammer Drill. Henry Schumacher, Denver, Colo. (U. S. No. 1,205,485; Nov. 21, 1916.)

Electrolysis—Process and Apparatus for Recoving Metals from Liquids. Charles E. Holland, New York, N. Y., assignor to Metals Electro-Recovery Co. (U. S. No. 1,205,207; Nov. 21, 1916.)

Flotation—Method of Concentrating Ore by Flotation. Gustaf Gröndal, Djursholm, Sweden, assignor to Beer, Sondheimer & Co., Frankfort-on-the-Main, Germany. (U. S. No. 1,202,512; Oct. 24, 1916.)

Leaching Ores and Other Products. John Edward Rothwell and Hugh Blackie Lowden, Denver, Colo., assignors to Colorado Iron Works Co., Denver, Colo. (U. S. No. 1,205,936; Nov. 21, 1916.)

Magnesium—Process of Producing Magnesium Compounds. Samuel Peacock, Philadelphia, Penn., assignor, by mesne assignments, to Marsden, Orth & Hastings Co., Inc., New York, N. Y. (U. S. No. 1,205,659; Nov. 21, 1916.)

Shaft Hanger. Joseph Dierdorff, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co. (U. S. No. 1,205,601; Nov. 21, 1916.)

Sintering—Process for Sintering Fine Ores, Flue-Dust, Purple Ore and the Like. Carl Giesecke, Bad Harzburg, Germany. (U. S. No. 1,205,944; Nov. 21, 1916.)

Sintering Machine. Frederick W. Yost, New York, N. Y., assignor to American Ore Reclamation Co, New York, N. Y. (U. S. No. 1,204,633; Nov. 14, 1916.)

Slimes—Apparatus for Treating Slimes. David Cole, Tucson, Ariz. (U. S. No. 1,205,327; Nov. 21, 1916.)

Slimes—Art or Method of Treating Slimes. David Cole, Tucson, Ariz. (U. S. No. 1,205,326; Nov. 21, 1916.)

Sulphuric-Acid Chamber. John Harris, Sheffield, England, and David Hibbert Thomas, Morriston, Wales. (U. S. No. 1,203,615; Nov. 7, 1916.)

Sulphuric Acid—Method of Manufacturing Sulphuric Acid. Andrew Miller Fairlie, Copperhill, Tenn. (U. S. No. 1,205,723; Nov. 21, 1916.)

Titanium—Method for Producing Composite Titanic-Oxide Products. Louis E. Barton, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,205,144; Nov. 21, 1916.)

Tuyere—Walter D. Ross, Jr., Anniston, Ala. (U. S. No. 1,205,568; Nov. 21, 1916.)

Water Jacket. Henry Rude, West Allis, Wis., assignor to Allis-Chalmers Manufacturing Co, Milwaukee, Wis. (U. S. No. 1,204,688; Nov. 14, 1916.)

Assessments

Company	Delinq.	Sale	Amt.
Atlantic, Ida	Dec. 9	Jan. 9	$0.001
Buffalo, Ida	Nov. 15	Dec. 12	0.005
Challenge, Nev	Nov. 29	Dec. 20	0.05
Christmas, Utah	Nov. 20	Dec. 16	0.005
Con. Virginia, Nev	Dec. 8	Dec 29	0.05
Cottonwood King, Utah	Nov. 14	Dec. 1	0.005
Eagle Mtn., Ida	Dec. 22	.....	0.001
East Hercules Ext., Ida	Jan. 2	Feb. 2	0.0005
Emerald, Utah	Nov. 15	Dec. 9	0.004
Eureka, Ida	Dec. 9	Jan. 9	0.001
Exchequer, Nev	Dec. 5	Dec. 27	0.03
Federal Ely, Nev	Dec. 2	Dec. 20	0.005
Four Timbers, Ida	Dec. 2	Jan. 2	0.002
Hector, Ida	Dec. 22	Jan. 16	0.005
Idaho-Nevada, Idaho	Nov. 15	Dec. 16	0.002
Idora, Ida	Nov. 24	Dec. 23	0.005
Iron King, Ida	Dec. 9	Jan. 9	0.001
Lehi Tintic, Utah	Nov. 8	Dec. 2	0.0025
Lion Gold, Utah	Nov. 13	Dec. 5	0.0025
Mayflower, Ida	Dec. 23	Jan. 25	0.005
Mexican G. & S., Nev	Nov. 25	Dec. 18	0.10
Mines Dev., Utah	Nov. 17	Dec. 7	0.30
Naildriver, Utah	Nov. 4	Dec. 4	0.01
National Lead, Ida	Nov. 25	Dec. 26	0.001
Nevada-Stewart, Ida	Nov. 14	Dec. 2	0.002
New Hope, Ida	Oct. 11	Dec. 11	0.002
North Star, Ida	Oct. 10	Dec. 5	0.001
Paloma, Utah	.....	.....	0.015
Pittsburgh Cons., Utah	Nov. 17	Dec. 8	0.0175
Reindeer Queen, Ida	Dec. 16	Jan. 22	0.005
Rico-Argentine, Colo	Nov. 18	Dec. 5	0.01
Silver Moon, Ida	Nov. 25	Dec. 23	0.005
Sonora, Ida	Nov. 15	Dec. 6	0.004
Tarbox, Mont	Dec. 22	Jan. 13	0.005
Tiberius, Ida	Dec. 21	Jan. 12	0.00075
Utah United, Utah	Nov. 15	Dec. 4	0.01
Wallace M., M. & R., Ida	Dec. 8	Jan. 8	0.0025

The publication of this table will be discontinued after Dec. 30, 1916.

Editorial Correspondence

SAN FRANCISCO—Nov. 22

Mother Lode Mines in Amador County have resumed underground work and some of the mills are running. Most of the properties have nearly a full complement of men and all expect by Dec. 1 to be in fairly good running shape, both as to mine extraction and ore treatment.

New Oil Wells drilled in California fields total 627 for 10 months of 1916. The present rate of work, according to the view of the state oil-and-gas supervisor, will continue for the remainder of the year, giving a total of more than twice as many new wells as were completed in 1915. The rising price of oil has caused activity in all fields similar to that of six years ago. Although a great deal of the work is being done on land already known to be productive, there are wildcat wells in most of the fields which, if successful, will develop new oil areas. All of these prospective additions, however, will probably not equal that made by the opening of the Midway field in 1910. The possibility of northward extension in the Coalinga field will be demonstrated by a well now being drilled. A number of wells are drilling in the region northeast of the old McKittrick field. In the vicinity of Los Angeles, three wells are drilling on the low range of hills between Long Beach and Beverley. This region is of particular interest for its oil possibilities. North of Ventura two companies are drilling in new territory, one finding some of the lightest oil yet recorded in the state. There is more activity in the Santa Maria field than for many years and extensions of proved land near Cat Cañon and Casmalia are practically assured. This section of the field produces the heaviest oil in the state and production could be advanced by constructive action on the part of the Federal Government in dealing with oil lands already developed.

DENVER—Nov. 23

Roosevelt Tunnel will probably be in condition for the resumption of driving about Dec. 10. Timbering of the Elkton shaft continues rapidly and work at the tunnel breast will be resumed as soon as this timbering is completed. The breast is about 2,100 ft. ahead of the Elkton shaft but no work has been at the face since Nov. 17.

Wellington Mine at Breckenridge was materially improved in equipment during the last summer by the erection of a new commodious boarding house, an addition to the mill building for the enlarged flotation department, the installation of a second roaster and the construction of large ore-storage bins. Two adventitious finds have been recently made in the property, a blind vein being exposed while sinking a shaft for the known Oro vein and another blind vein being uncovered during the digging of a ditch to convey water to the new boarding house. Both veins are similar in mineral contents to the other veins worked for several years and are probably members of the same system.

Deep Mining is the slogan for Cripple Creek these days. Contrary to the fears of numerous authorities in the early days of the district, development at depth has proved the mineralization not only fully equal to that in the surface or oxidized zone but in some instances better. This condition is reflected prominently in the mining-stock markets of which Cresson is an example. The recent disclosure on the 1,800 level of Vindicator is noteworthy, the shoot having been drifted on for 700 ft. and crosscut 40 ft.; it is said to average nearly 1½ oz. gold per ton. The new flotation mill at the Vindicator mine is making an extraction of around 80%; experiments are being conducted to increase this percentage.

Kokomo-Robinson District, just over the range north of Leadville, near the head of Ten Mile Creek, in Summit County, is active. Geologically, the measures compare closely with those at Leadville, the shoots being chiefly masses of silver-gold-lead-zinc ores occurring as replacements in limestone. This region languished because of low prices for silver and heavy penalties exacted for zinc, and time has been required to overcome the former prejudices against it. The average altitude is high and the open season for prospecting and performing surface improvements is short so that the winter, already set in, came soon enough to prevent several projects attaining their stride this year. Another year will witness greater activity than this. The old Robinson mill (sometimes spoken of as the Wilson mill) has been completely remodeled by the Progress Mining and Milling Co. and is being operated as a custom plant, the complex lead-zinc ores from local mines being concentrated by flotation and on tables. The working force at the mill is comprised, almost exclusively, of experienced millmen who are refugees from Mexico. Among the mines furnishing ore to the plant are the Robinson Tunnel (adjacent to the mill), Felicia Grace and Colonel Sellers. Elk Mountain Mining and Milling Co., new owner of the Wilfley mine and mill, mines about 50 tons per week. The Michigan mine produces from 200 to 300 tons weekly. Raven-Eagle mine, leased by Bryant & Ritch, shipped 75 tons during October.

LEADVILLE, COLO.—Nov. 23

Leadville's Output fluctuates with the seasons and the recent months probably represent maximum production. Therefore, to be conservative, it is prophesied that the average production for the year will be found to be about $1,500,000 per month. Indications are strong that 1917 will send these figures up considerably for there are several important projects now approaching their productive stage as, for instance, the Leadville Unit, the Empire Zinc Co., the Downtown Mines Co. operations, etc. Trackage is now being laid for switching purposes to the Jamie Lee shaft of the Leadville Unit on Fryer Hill and to the McCormick shaft of the Empire company on Carbonate Hill.

The Labor Situation has not changed, except that the crisis which was expected immediately following election has failed to materialize. The matter, however, is far from being settled. The union leaders are still busily engaged with their organizing campaign and report that they are meeting with success. This ceaseless effort on the part of the workers is looked upon with suspicion by the operators who believe that, in spite of the declaration of the union stating there will be no strike, a successful organization of the miners in the district can lead to nothing else. The operators continue to stand pat on their refusal to treat with representatives of the Western Federation of Miners. The state industrial commission, which was to investigate the situation and recommend what changes seemed advisable, has done nothing as yet. Although the strike topic has lost a great part of its interest for the present, it is looked upon as subject for future consideration. It is rumored that unless the union secures part of their demands, a strike will be called in the spring. The uncertainty created by the unsettled conditions is causing important developments planned for the coming year to be held in abeyance. Unless a decision in the matter is reached, the posibility of a future strike will tend to check big mining in the district.

BUTTE, MONT.—Nov. 23

Anaconda Safety Methods were given a high compliment by H. J. Rahilly, of the U. S. Bureau of Mines, who has been in Butte. After a visit to the mines of the company he stated that it has the most advanced and practical methods of rescue work and accident elimination of any mining company in United States. September record shows not a single death in any of company's 27 Butte mines. Only 23 accidents incapacitated men for two weeks or more. In that month 324,404 shifts were worked.

A Sequel of the Cold Snap of last week was the closing of the Anaconda company's Butte copper mines for the night of Nov. 17 to allow the Washoe and Great Falls smelteries to catch up in treating the accumulation of ore that had frozen in transit and in bins during the cold spell. Company's zinc mines were all kept going. At the company's Great Falls works, the third unit of the new zinc plant will be put into operation within a few days. The three units will take care of the present output of the zinc concentrator at Anaconda and, with the two units yet to be completed, will be able to turn out approximately 6,000,000 lb. of zinc a month. The final units are expected to go into commission by the end of the year.

Injunction Asked by Minerals Separation, Ltd., to prevent paying dividends or transfer of assets by Butte & Superior Mining Co., presents a new phase in the suit of Minerals Separation against Butte & Superior. Alleging that the Butte & Superior company is disposing of its assets and its enormous war profits in excessive dividends to stockholders and is negotiating sale or amalgamation of its properties to the American Zinc, Lead and Smelting Co. in order to defeat any judgment which may be rendered against it for infringement of patent, the Minerals Separation, Ltd., on Nov. 20 filed a motion in the Federal Court to "increase greatly" the present $75,000 bond, or to enjoin the company from declaring dividends. No specific amount for the enlarged bond was mentioned in the motion. The matter was left to the discretion of Judge Bourquin of the Federal Court, who has set Nov. 23 as the date for hearing arguments. Attorneys for the defendant company claim that in view of the present status of its case against the Butte & Superior company, Minerals Separation was entitled to no bond to secure a possible judgment. That the decision of the Circuit Court of Appeals by reversing Judge Bourquin's first decision in favor of the English company, obviated the necessity of any bond whatever, although the reversal has been suspended pending adjudication in the United States Supreme Court, where the matter now rests for final decision. That furthermore, the defendant company held $2,000,000 worth of American Zinc stock, representing assets in excess of any damages which may be awarded. The decision of the Supreme Court is expected in the near future.

SALT LAKE CITY—Nov. 24

American Fork District is unusually active this season. In addition to some of better known properties such as Pacific, Dutchman, Earl-Eagle, Miller Hill, etc., many other properties are being worked. The Pacific, which has just paid a dividend, is rapidly bringing its mill to completion. The Green Leasing Co., operating at the Yankee, has a shipment of high-grade silver-lead ore ready for the market. Tunnel work is being done under contract at the Osborne; the Bog is working, and work is to be resumed at the Wasatch Range, the tunnel of which is now in 365 ft. New company—Silver Side Mining—has been organized to operate claims near fork of cañon; tunnel in 45 ft. is to be continued 200 ft. under contract; ore is silver-gold. Work at the Gold Hill, at head of Silver Flat Creek, is being pushed; No. 2 tunnel—in 100 ft.—has cut low-grade copper ore.

OATMAN, ARIZ.—Nov. 21

Three Important Mills will be in operation in 1917 in the Oatman district; these will be at the United Eastern, Tom Reed and Big Jim properties. The United Eastern mill is practically completed, and will be grinding in about 30 days; this mill was designed by Otto Wartenweiler, of Los Angeles, and will have a capacity of 200 tons per day. Additional milling capacity is to be provided at the Tom Reed as a result of the developments in the Aztec claim. Orders have already been placed for electrical equipment and for some mill equipment, as from five to seven months is required for delivery. Preliminary specifications for the Big Jim mill are completed, but before making final decision as to equipment, Manager A. G. Keating will spend a month or two studying the latest methods being used in the gold and copper plants throughout the country. The Big Jim mill will be placed just west of the working shaft of the company. These three companies all have important ore reserves, with probabilities of much more being opened up. Milling by a new process has been started at the Gold Dust plant; the equipment consists of a Marks rotary pulverizer and a Zimmer centrifugal separator or amalgamator. Cheap milling costs are claimed for this equipment, but the mill has not been in operation long enough to demonstrate these claims.

DULUTH, MINN.—Nov. 25

Shipments of Over 21,000,000 Tons of iron ore had left the Duluth, Missabe & Northern Ry. docks up to Nov. 22, or 6,000,000 tons more than the entire 1915 tonnage from these docks.

Hammell-Feigh Suit at Duluth is attracting some attention in the Cuyuna range. Patrick Hammell has brought suit against Thomas Feigh, wealthy mine owner, for one-half interest in Cuyuna range properties, stated to be worth $5,000,000. Feigh owns the fee to a property under lease to Northern Pacific interests and the latter have just inaugurated mining operations. It is assumed that this is the tract in question. Hammell claims an agreement of many years' standing whereby he was to select lands of mineral value and Feigh was to furnish the money, the profits to be divided equally.

Graft Cases at Hibbing will shortly come up for trial, the grand jury having reported 29 true bills in Hibbing village and Stuntz township, naming the following citizens: Victor E. Power, mayor; D. D. McEachin, ex-treasurer; R. M. Hitchcock, proprietor of "Hibbing Daily Tribune"; Claude M. Atkinson, proprietor of "Mesaba Ore"; D. D. Haley, recorder; Runert Swinnerton, trustee; John Curran, trustee; B. J. Burrows, trustee; W. J. Ryder, ex-member of water, light, power and building commission; Jacob Messner, supervisor, Township of Stuntz; Albert Dixon, supervisor, Township of Stuntz; Samuel Salverson, citizen; and John Mulvahill, citizen. The indicted men are all out under bail. The authorities of the "richest village on earth" have for years defied the mine operators, who pay the great bulk of the taxes, but their career of gross extravagance seems now to be approaching the end.

ISHPEMING, MICH.—Nov. 25

Shipping Season Is Drawing to a Close in the Lake Superior district, the cold weather having greatly hindered operations. Little ore is now going out from the Michigan ranges, and there will

not be many more cargoes to go from Minnesota. Many of the pit properties have been closed for the year, and the underground mines have commenced to stock ore for shipment next season. The railroads have been bothered considerably because of ore freezing in the cars, and on one day last week the Great Northern road had many cars of frozen ore at the Allouez docks, as well as 100,000 tons frozen in the dock pockets. A great deal of extra expense was required to unload the ore, steam being made use of freely. Many of the Lake freighters are now carrying grain and are through with the ore business until next spring. The Lake freights for next year have already been set, the price to be $1 a ton from the head of the Lakes to Lake Erie ports, 90c. from Marquette, and 70c. from Escanaba. This is an advance of 50c. a ton over the existing rates. Some "wild" cargoes are now being handled at $1 a ton, the Shenango Furnace Co., which is through shipping its own ore for the year, having charters with other companies at that figure. The company has five boats, each of which has a capacity of over 10,000 tons. Now that the vesselmen have set their rates for 1917, the mining companies will not be slow in making their next year's prices. This is the first instance in years where the Lake rates have been set in advance of ore rates. It is generally believed that iron ore will get an advance of from $1.25 to $1.50 a ton, which would not be a large increase, when the pig-iron and steel prices are taken into account. The mining companies will have to pay 50c. more a ton to get their ore down the Lakes, and mining costs will be greater. The steel Corporation has announced an increase in wages of 10%, which will include the employees of the Oliver Iron Mining Co. The other iron-ore companies will also announce an advance, a decision having been reached at a meeting of the large operators in Duluth.

HOUGHTON, MICH.—Nov. 24

Coal Situation in Northern Michigan, where it is impossible to get any more coal this winter, excepting by rail and then at such great freight rates as to put the price at a prohibitive figure, is illustrated by the Winona's predicament. It may become necessary for the Winona to shut down, owing to the lack of coal supply. Not a mine in the Lake Superior district has all the coal needed. Unless there is a short winter, there will be difficulties in the spring.

All Lake Copper Mines will show increased outputs this year over 1915, which was looked upon as about the maximum copper production of the district. The output for the Lake Superior district in 1916 will be between 260,000,000 lb. and 265,000,000 lb. of copper, this estimate being based on the performances of the properties to date and the expectation for the next 40 days. Notable increases have been shown in three properties, subsidiaries of the Calumet & Hecla. They are the Allouez, now going its best stride and likely to show a 12,000,000-lb. rate at present (yet counted as only a 10,000,000-lb. producer under average normal conditions), the Ahmeek and the Isle Royale. All three of these properties are doing better than ever before in their history. Isle Royale and Allouez are showing not only greater rock tonnage but greater percentage of copper than ever before. Ahmeek is maintaining its unusually high average. Calumet & Hecla will do better than in 1915 and so will Copper Range, Mohawk, Quincy and other standard producers, but there will be no sensational increases as each of these properties made remarkable records in 1915. Copper Range mines are maintaining their high-grade rock, especially at the Champion.

JOPLIN—Nov. 25

Improved Railroad Service to Oklahoma mines is in sight. A. H. Rogers, president of Southwest Missouri Railroad Co., has announced intention of his company to extend interurban line now running from Carthage—through Joplin—to Galena, Kan., to Baxter Springs, Kan., and it is known he contemplates extension from there to mines of Picher-Cardin-Century section, which is only two or three miles farther. From the other end, the O. K. & M., which recently established service from Miami through Commerce to Picher, has just announced purchase of two new modern cars which it will use to improve service.

Shortage of Electric Current is doing more to curtail the output from this district just now than any other one thing. The long drouth has made it nearly impossible for the local company to produce current from water power at its Spring River dam, and the low water is causing much boiler trouble at its steam generators at Riverton. The company is now installing an expensive plant for water purification and has purchased another turbine and is promising a largely increased supply of current not later than Jan. 1. Meantime, out of more than 200 mills electrically equipped in this district, not one is being permitted to operate straight through as would, in almost every instance, be the program if there was no curtailment of electric current. At Granby, the lead smeltery of the American Zinc, Lead and Smelting Co. has been closed, through the withholding of current, and the big Klondike mill is operating only at about one-half capacity When this plant was designed it was originally intended to use steam, but electricity was ultimately decided upon and it was this that brought the first power lines to Granby.

TORONTO—Nov. 24

The Alleged Shipment of Nickel from Canadian ore to the Germans is a controversy that is becoming fiercer and arousing strong public feeling. It forms the principal topic at political gatherings and in newspaper discussion. On Nov. 23 last, the first official statement as to the position of the Canadian government respecting the recent phases of the question was made by Hon. Arthur Meighen, Solicitor-General, at a meeting held here. He strongly emphasized the point that had the exportation of nickel from Canada been stopped, the manufacture of munitions for the Allies in the United States would have been hindered and a year and a half would have elapsed before it could be refined in Canada for use in the war. In working out the system of control the Ministry had acted strictly in acordance with the advice of the British government. "The government of Great Britain," he went on to say, "through its Committee on Enemy Supplies is in daily, weekly, monthly control of all the output of the International Nickel Co. in so far as that output goes overseas, or into plants in the United States. They are in a position to know who should receive it and who should not. I am in a position to say and at the proper time to prove that not a pound goes to a factory in the United States, or to a vessel from that country, save with the approval of the British Admiralty and the British government." In reply to the statement that no nickel had come from New Caledonia to the United States since the war began, he quoted records of shipments to show that during 1915 a total of 3,462 tons of nickel matte was received by the United States Nickel Co. from New Caledonia and that up to August of the present year the shipments amounted to 2,630 tons. This was equivalent to a production of 150 tons per month in addition to 100 tons per month produced in the United States as a byproduct of copper, over which Canada had no control. Mr. Meighen dealt with the charge that Henry R. Merton & Co., the British agents of the International Nickel Co., had been convicted of trading with the enemy, stating that this was early in the war and that the Merton company had since been reorganized, the shares formerly owned by Germans being now held by British subjects.

The Mining News

ALABAMA

GRAPHITE MINING is very active, especially in Clay County. Over 18 graphite mills in operation or under construction.

FLAKETOWN GRAPHITE CO. (Mountain Creek)—Shipping one car per week from this station in Chilton County; F. R. Taber, president. Another mine in this section may be operated after Jan. 1.

ARIZONA

Cochise County

PEERLESS COPPER (Dragoon)—Work resumed; will drill 50-ft. holes with Sullivan diamond drill; V. C. Joslyn, general manager.

BISBEE COPPER MINING AND DEVELOPMENT (Bisbee)—Has begun shaft sinking on Pauline claim, although hoist is not expected for fortnight. Two churn drills are reported to be in operation.

HILLTOP METALS (Rodeo, N. M.)—Haulage and development tunnel through mountain, 3,200 ft. practically completed; tunnel cut several copper and lead oreshoots; over $100,000 worth of machinery purchased; plans extensive development; building wagon road to Rodeo, N. M.; smeltery being considered.

Gila County

INSPIRATION (Miami)—Hoisting and crushing plant broke record by hoisting and crushing 21,300 tons in one day.

INSPIRATION NEEDLES (Miami)—Drill hole No. 1 down 815 ft.; preparing to begin holes Nos. 3 and 4; two additional Star drills ordered.

IRON CAP COPPER (Copper Hill)—Vein 18 ft. wide on 600-ft. level, containing iron and copper sulphides. High-grade ore in winze from 900-ft. level; vein 4 ft. wide in places.

ARIZONA COMMERCIAL (Copper Hill)—Shipping 150 tons daily. Vein on 14th level is about 50 ft. wide, with 15 ft. of smelting ore. Sinking Copper Hill shaft to 16th level. Pumping about 700,000 gal. daily; pumping capacity now 1,500,000 gal. About 160 men working.

MIAMI CONSOLIDATED COPPER (Miami)—Made a shipment of 6% oxidized ore to Old Dominion smeltery. Drill hole No. 1 located; purchased five patented fractions lying between property and the Inspiration Needles and Southwestern Miami.

Mohave County

MIDNIGHT (Chloride)—Rich strike reported on 200-ft. level; operated by G. S. Holmes and associates under option.

BIG JIM (Oatman)—Approximately 240,000 tons of ore practically assured; oreshoot opened for a length of 740 ft. Further sinking to be done at once.

UNITED EASTERN (Oatman)—Housing of mill is practically completed and most of machinery is in place. Main working shaft is being connected with lower level (665-ft.) of old workings, equivalent to 790 ft. in new shaft.

Pinal County

ARIZONA RAY COPPER CO. (Ray)—Churn drill No. 1 working three shifts; second drill on property and third ordered. Hole No. 1 lost; hole No. 2 down 100 ft. on Nov. 24. Edmund L. Hiatt, superintendent.

LAKE SUPERIOR & ARIZONA (Superior)—Rumored consolidation with Magma will not take place. Now stated that Magma will buy for cash one claim projecting into Magma territory, near recent developments in rich ore. Some outlying claims may be consolidated with Lake Superior & Arizona, the financing to be done by certain Magma stockholders.

Yavapai County

JEROME DAISY (Jerome)—Shaft through iron capping and into schist.

UNITED VERDE CONSOLIDATED COPPER (Jerome)—Diamond drills delivered on ground.

TIP TOP (Prescott)—High-grade silver ore struck on 350-ft. level.

NEWS MINING CO. (Jerome)—Reported optioned to Calumet & Arizona Mining Co., of Warren, Ariz.

VERDE MONSTER (Jerome)—New company being organized by T. F. Shea and other Jerome men; two million $1 shares; property, 600 acres, about 2 mi. southwest of Jerome.

UNITED VERDE (Jerome)—Stated to be making preparations to steamshovel large body low-grade ore near old smeltery site; may carry steam-shovel operations down to old Hampton stope.

LOMA PRIETA MINES CO. (Skull Valley)—This Prescott company is developing group of 27 claims in Copper Basin district, adjoining Commercial Mining Co. Chalcopyrite encountered at 62 ft. in shaft, which is in ore at 150 ft.; sinking to 500 ft. At 140 ft., two drifts run for 200 ft. A. B. Peach, superintendent; T. G. Norris, of Prescott, president. May build 100-ton mill.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—Resumed operation with 40 stamps dropping.

KENNEDY (Jackson)—Operation resumed underground and progress being made on the surface; probably have 100-stamp mill in full operation by end of month.

PLYMOUTH CONSOLIDATED (Plymouth)—Output for October was 7,900 tons; estimated value, including concentrates, £10,778. Working expenses, £5,254; development, £1,396; surplus over working and development, £4,128; capital expenditure, £1,370.

ORIGINAL AMADOR (Amador)—Mill completely remodeled. Regrinding in Hardinge mills, 8 ft. by 22 in. and 8 ft. by 36 in.; capacity increased from 150 to 250 tons per day. New development on 850 level north and south drift satisfactory. Ore better grade than formerly. Deepening of shaft will begin on Dec. 1; contemplates sinking to 1,500-ft. point. Tailing dam raised 5 ft. to increase capacity necessary. A. A. Busey, manager.

Butte County

MASCOT (Oroville)—This old producer in Morris Ravine will be equipped with the mill formerly at the Cape Horn mine. Recently the lost vein was found by W. T. Baldwin, who will develop the property. Other properties in the district are busy, including the Bumble Bee, the Banner and the Butterfly.

Calaveras County

TULLOCH (Angels Camp)—Being developed under bond by Thomas I. Lane, who is sinking a three-compartment shaft.

CALAVERAS CONSOLIDATED (Melones)—Tunnel advancing rapidly. Six new 2-ton side-roll-dump cars installed and bungalow completed for Superintendent James A. Davis.

UTICA (Angels Camp)—Discontinued use of air on winze hoist; remodeling hoist to electric drive. Reported that Stickels mill will drop full number of stamps as soon as hoist is in operation.

BRUNNER (Angels Camp)—Added to the Tulloch in the development being prosecuted by Thomas Lane. Paying bonus on extra footage made by miners in sinking at the Tulloch, resulting in rapid work and larger pay for the men than any other underground men in the camp.

Nevada County

IN MEADOW LAKE DISTRICT, near Truckee, the Old Man Mountain mine reported sold by H. D. Ramsey with other properties in the district for a sum approximating $100,000. Peter Bokay, owner of the Bokay Bonanza, has leased other properties. A. Huber reports good ore in the Lucky Strike. Ore has been found in the Freeman claim by P. D. O'Connor. In the spring, development promises to be active in all parts of district.

Plumas County

TEFFT (Quincy)—The property situated on Crescent Hill, 5 mi. south of Quincy, recently purchased by H. H. Kelly, of Santa Ana, and associates. New roller mill and other machinery installed. Will be driven by gasoline engine. Large amount of milling ore on the dump, result of development by former owner. New mill capacity 50 tons in 24 hr.; will be operated on half time during winter. J. F. Groover is superintendent.

Tuolumne County

JUMPER (Jamestown)—High-grade ore reported by leasers in Golden Rule claim. In the last three years much gold produced by the leasing system; both men and company satisfied with results.

SPRINGFIELD TUNNEL (Columbia)—Only a few men at present retained to keep property in condition for early resumption of operaton. Prospecting with Keystone drill, electrically driven, will be inaugurated to ascertain exact position and value of gravel.

Yuba County

YUBA CONSOLIDATED (Hammonton)—Yuba No. 16 launched Nov. 26. Dredge will be same size as No. 15, but will have two stackers to reclaim Yuba River channel.

COLORADO

Clear Creek and Gilpin Counties

GRAND-CLEAR CREEK (Empire)—Work under way again on this property in Daly district. Tunnel in 600 ft.

EMPRESS (Freeland)—Acquired recently by Gilpin Tungsten Production Co. Development will begin at once through 500-ft. crosscut tunnel.

ARGO LEASING CO. (Empire)—Building for new mill finished and machinery now arriving. Property consists of 22 claims in Daly district.

GIBSON (Central City)—Repairing the 400-ft. shaft. Milling-grade ore opened on 150-ft. level and gold-silver ore assaying $80 per ton on 250-ft. level. Mine belongs to Star of the West group.

GILPIN-ORION (Central City)—Merged with Combination Mining and Milling Co., a Denver organization owning mining interests in Grand County. Gilpin company has 40 acres on Bob Tail Hill; deal provides development fund for this property.

PITTSBURGH CONSOLIDATED (Freeland)—Work resumed under management of J. C. Sturdevant. Old producer, but now filled with water; being drained through McClelland tunnel. Property comprises nine claims and Dover mill at mouth of Fall River.

Gunnison County

VICTOR (White Pine)—Worked by lessees. Lead and zinc carbonate ores shipped.

BON TON (Pitkin)—I. L. Johnson contemplates adapting the Quartz Creek mill to flotation to recover molybdenite.

COLORADO COPPER (Iola)—Leased Anaconda mine; steam hoist and boiler being installed and sinking will be resumed.

San Juan County

PIKE COUNTY (Ophir)—Under development by Louis Lomax, of Telluride.

CROWN JEWEL (Silverton)—Ore being packed from this mine to Silverton.

CARRUTHERS LEASING (Telluride)—Aërial tramway between mine and new mill completed and in operation.

SANTA CRUZ (Ophir)—Being developed by Wichman & Co. Lessees are shipping payable ore from development.

FRANK WALLER (Howardsville)—New vein opened in No. 2 tunnel. Gold-silver-lead ore being shipped from west drift.

BROADGAUGE MINING AND MILLING (Silverton)—Shoot good-grade ore opened in lower tunnel of this Burns Gulch property.

KITTIMAC (Silverton)—Two shifts working; considerable development work under way. Mill operating steadily after being thoroughly overhauled and new Hyde classifiers installed. Buildings all repaired for winter and several snow-breaks built above them and the tram towers.

Summit County

MICHIGAN (Kokomo)—Both iron and lead ores being shipped; latter from shoot recently discovered.

SURPRISE (Frisco)—Shipping lead-silver ore. Mine operated by lessees. Tunnel being driven to cut vein below old workings.

MASONTOWN (Frisco)—Development work under way. Considerable ore opened. Mine equipped with good hoist and milling plant.

IDA BELLE (Montezuma)—High-grade lead-silver ore opened in second-adit level by lessee Joe Childers. Shipments recently made; ore of last strike of much higher grade. Mine will be worked all winter, but shipments must be discontinued on account of snow as ore has to be packed to Keystone station.

Teller County

BLACK DIAMOND (Cripple Creek)—Developed recently by Gibbs & Co. Sorted ore produced during development assays 2 oz. gold a ton.

ELKTON (Elkton)—Main shaft being retimbered from the collar down to 25 ft. below 200-ft. level, and active development will be resumed.

ACACIA (Cripple Creek)—New oreshoot has been opened in Shurtloff vein on 1,200-ft. level at a point 150 ft. north of the South Burns shaft. Lessees Quinn & Burrows have opened body of $70 ore at junction of Shurtloff and American Eagle veins on 1,100-ft. level.

MARY McKINNEY (Anaconda)—Shaft now 1,360 ft. deep. Included in present year's work is a drift advanced to the main vein on the 12th level; at a point about 300 ft. west of the shaft a pockety body of payable ore was opened; development in north heading continues; some flat veins of payable ore were opened in eighth level, and drifting is in progress on the ninth level to open these veins. Station on bottom level is nearing completion and crosscut will soon be started to the main vein; distance is estimated at 330 ft.; as soon as crosscut reaches vein a drift will be advanced each way from the intersection. Development on the 11th level continues, although no payable ore has been encountered recently.

IDAHO

Shoshone County

HYPOTHEEK (Kingston)—Officials deny option has been given to Rex Consolidated. Sinking shaft from 1,100 to 1,300 level.

HECLA (Burke)—Addition to mill will be completed by Dec. 15, which will increase capacity from 450 to 700 tons per day. Hecla now uses Stewart mill, owned by Federal company; lease will expire when above addition is completed.

COEUR d'ALENE ANTIMONY MINING (Kellog)—At annual meeting, capital stock increased from 500,000 to 1,500,000 shares; voted to investigate question of local treatment of concentrates. Shoot of ore, 3 to 6 ft. wide, opened for nearly 500 ft. Shaft to be sunk additional 100 ft.

MORNING (Mullan)—Output will be largely increased after Dec. 15, when Stewart mill, at Wallace, will be utilized. The Stewart mill has a capacity of 500 tons and the Morning mill 1,000 tons. It is understood that both will be run at capacity. Properties owned by Federal Mining and Smelting Co.

NORTHERN LIGHT (Wallace)—Fourth vein cut at this Pine Creek property recently; it is 26 ft. wide, a third of which is of shipping grade, both lead and zinc; vein was cut in crosscut from shaft at depth of 400 ft. Three other veins have been explored at depth of 200 and 400 ft.; disclosed considerable ore. Ben G. Harmon, manager. Control of company is owned in St. Paul.

MARYLAND

ALUMINUM CO. OF AMERICA (Pittsburgh, Penn.)—A subsidiary, known as the Aluminum Ore Co., has bought 150 acres at Sollers Point, near Baltimore, where it is reported a plant is to be erected for treatment of bauxite.

MICHIGAN

Copper

ALLOUEZ (Allouez)—Shipping 2,000 tons to the mill daily.

CENTENNIAL (Calumet)—Shipping 600 tons daily. Grade improves as northern boundary is approached.

MOHAWK (Mohawk)—Refined copper output for October, 1,233,463 lb., as against 1,145,762 lb. in September.

ADVENTURE (Greenland)—Shipments will be made to the Winona mill about Dec. 1 from the Butler and Knowlton lodes.

VICTORIA (Victoria)—New tables being installed at the mill will increase capacity from 550 to 700 tons. Twelve rock drills ordered.

MICHIGAN (Rockland)—Drifting on the Evergreen lode will be started soon. The 270-ft. drift on the Ogimah lode has shown good mineralization; fault encountered on the Butler lode.

WHITE PINE EXTENSION (Pinex)—Having trouble in taking care of surface water seeping through to the 200-ft. level. Some pumps will be ordered; as soon as this water is taken care of sinking will be resumed. Drifts at 200-ft. level are in rock, running about 30 lb. copper to the ton.

CALUMET & HECLA (Calumet)—Leaching plant is running successfully and has required no changes from original plans; because of delay in receiving materials only one-half of plant is operating, but plant will be brought up to 2,000 tons capacity early next year; will probably be increased to 4,000 tons later. Company is shipping 5,600 tons daily from the conglomerate lode, in which 170 drills are now being operated.

FEDERAL SYNDICATE CO. (Calumet)—Recently organized under the laws of South Dakota, with 1,000,000 shares of $1 par value, to develop about 360 acres, supposed to be on the Kearsarge lode, southeast of the Phœnix; also negotiating with the Charles Kingston estate for 100 acres additional in same region. A. C. Steinlow and Dr. P. D. MacNaughton, P. L. DeVoist and Ernest LeDuc, of Duluth, are interested. Dr. P. D. MacNaughton, of Calumet, is secretary-treasurer.

Iron

JONES & LAUGHLIN ORE CO (Ishpeming)—Operations have stopped at the pit property at Iron Mountain Lake. Will be resumed in spring.

CORRIGAN-McKINNEY (Crystal Falls)—No more lake shipments will be made; over 500,000 tons have been sent out this year. Considerable ore remains in stock at some of the mines.

MINNESOTA

Mesabi Range

HAWKINS (Nashwauk)—Two men killed Nov. 24 by premature blast in the openpit.

GREAT NORTHERN ORE (Duluth)—Company has announced that it is now asking $1.50 a ton more for its iron ore. M. A. Hanna Co. sells the ore.

SMITH (Hibbing)—Butler Bros. have taken lease and started stripping. About 30 men employed now. Will be heavy shipper in 1917. Property is west of big Mahoning and Hull-Rust pits.

HULL-RUST (Hibbing)—One day this week 1,800 ore cars were loaded in the pit by steam shovels. This is a new Mesabi Range record; average this year has been about 1,000 cars daily.

Cuyuna Range

NORTHWESTERN IMPROVEMENT CO. (Ironton)—Initial steps being taken to sink shaft on the Feigh property in Sec. 10, 46-29, near the Pennington pit. Operation will be under direction of the Great Northern Ore management.

ONAHMAN IRON CO. (Manganese)—At annual meeting, held in Duluth, W. P. Mars was elected president; W. A. McClaran, vice-president and general manager; M. A. Dunning, treasurer, and C. A. Lanigan, secretary. All are Duluth men. Company operates the Ferro mine.

SULTANA MINES CO. (Ironton)—This name was adopted at annual meeting of the Cuyuna-Sultana Mining Co. Company has acquired new property in Sec. 34, 47-29, about 1½ mi. north of the Sultana mine. The new property has been christened the Clarke mine.

MISSOURI

Joplin District

PIQUA (Granby)—Mine taken over by Edward McElhany, of Joplin, and others. Mill being overhauled.

E. J. PRATT (Webb City)—Optioned 60-acre tract near Baxter Springs, Kan., to Oklahoma men for $80,000.

KING JACK (Commerce, Okla.)—Another cave-in, in which a rougher jig and set of rolls were lost, has caused final abandonment of this property.

BLUE JAY (Miami, Okla.)—This new 250-ton mill being built by Commerce Mining Co., on tract just east of Blue Goose property at Cardin. To be ready by Feb. 1.

OWOSSO (Joplin)—At Duenweg property field shaft is being driven by raising. When complete will enlarge capacity of mill to 600 tons. Sheet-ground mine; operations at 238 ft.

BETHEL (Miami, Okla.)—Planning construction of third mill on 60-acre lease near Cardin. Two mills, known as Bethel and Domando, now making about 25 tons concentrates daily.

BALDRY (Joplin)—Opening second shaft on rich silicate property south of city. Made three cars of concentrates in three weeks with two men in ground. Has lead at 120 ft. and calamine at 135 ft.

SCHOOLHOUSE (Carterville)—This sheet-ground mine taken over by Chapman-Hosley Mining Co., of Joplin. Will increase mill to approximately 1,000 tons daily capacity. Expect to start in one month.

DICK TURPIN (Joplin)—This plant, down since last spring, expected to start soon. Principal owner, Doctor Sharp, of Kansas City, has been on Mexican border as member Kansas National Guard; recently returned home with regiment.

KLONDIKE (Granby)—This mill, one of largest in district, now owned by American Zinc, Lead and Smelting Co., is being handicapped through insufficient electric current. Better service promised in few weeks; third shaft now being opened; to be connected with tram shaft by surface railroad with gasoline locomotive. Operations at third shaft at 280 ft., deepest on this property.

MONTANA

Lincoln County

SNOWSTORM MINES CONSOLIDATED (Troy)—Employing between 500 and 600 men to hasten work preparatory to starting operations—expected to take place before end of year. Mill and buildings, flume and railroad are nearing completion. Considerable ore has been broken down at mine ready for treatment as soon as equipment is ready to receive it. Town of Troy growing rapidly has opened bids for municipal water system and made plans for other important improvements.

Madison County

CONREY PLACER MINING (Ruby)—Dredge No. 1 began leaking recently and sank to the bottom of its pond. A force of men is now engaged refloating dredge and making repairs.

REVENUE CONSOLIDATED GOLD MINES (Norris)—This company, main office, Hirbour Block, Butte, is sinking main shaft, now 300 ft. deep. Faulted Revenue vein encountered in Bowker winze and is expected to be cut by shaft at 360 ft. Company has also acquired Columbus and Lexington groups. G. D. B. Turner, president.

Mineral County

RICHMOND MINING, MILLING AND REDUCTION (Saltese)—This company operating Richmond group near Adair, Idaho, has acquired half interest in adjoining St. Lawrence group formerly controlled by Finch-Campbell estates and the Sutherlands, of Wallace, Idaho.

Silver Bow County

DAVIS-DALY (Butte)—Nordberg hoist, ordered some months ago for the Colorado mine, has been shipped from Milwaukee.

EAST BUTTE (Butte)—October production was 1,650,160 lb. copper; lowest since June. Continuing development from Shaft No. 1 below 1,800 level.

NORTH BUTTE (Butte)—Has closed contract with Anaconda for treatment of 150 to 300 tons of zinc ore daily. Zinc ore developed lately on 2,000-ft. level. Company's property abuts Elm Orlu and Black Rock mines.

BUTTE & SUPERIOR (Butte)—October statement of production, filed with court, showed 53,542 tons of ore mined and milled, resulting in 14,191 tons of concentrates, valued at $56.89 a ton. Cost of flotation was $2.82 per ton of concentrates.

BUTTE & GREAT FALLS MINING (Butte)—Word has been received that capital to carry on program of development has been raised. Operations were recently suspended, pending results of an effort to raise required funds by assessment. Company may enter old Neihart field, in Cascade County, to reopen some of the old silver mines, having optioned the Lexington and Ingersoll mines. R. M. Green, manager.

TUOLUMNE COPPER MINING (Butte)—October shipments to smeltery amounted to 52 cars, netting $20,000. November production expected to be double that amount. Estimated that there are 100,000 tons of ore in old stopes that can be profitably mined at present copper prices. At company's properties in eastern section, development is progressing rapidly and they are expected to be in shape for extracting ore by end of year.

BUTTE-DETROIT COPPER AND ZINC MINING (Butte)—Officially stated that arrangements with Davis-Daly company have been made to treat zinc ores from latter company in Butte-Detroit mill. Mill was built some years ago to treat ores from company's Ophir mine, in the southwestern section of Butte camp. After some alterations it will be capable of handling 500 tons of ore a day, 150 tons to be furnished by Davis-Daly and balance by ore now being developed in Ophir and in zinc mines, owned by other companies.

NEVADA

Humboldt County

ROCHESTER MINES CO. (Rochester)—October cleanup $57,800. East vein on 250-ft. level is stated to have widened to 18 ft.

NEVADA PACKARD MINES CO. (Rochester)—Initial dividend of 5c. per share, or about $58,235, declared payable Dec. 20. The 100-ton mill is to be doubled in 1917.

Lyon County

MASON VALLEY (Thompson)—Smeltery will be started as soon as coke supply can be obtained. Bluestone and Mason Valley mines being reopened.

Nye County

TONOPAH ORE PRODUCTION for week ended Nov. 18 was 9,597 tons, valued at $188,366, comparing with 9,757 tons for the previous week. Producers were: Tonopah Belmont, 2,725 tons; Tonopah Extension, 2,380; Tonopah Mining, 2,000; Jim Butler, 1,150; West End, 529; Rescue-Eula, 251; Halifax, 158; McNamara, 94; Monarch Pittsburg, 62; North Star, 52; miscellaneous, 178 tons.

JIM BUTLER (Tonopah)—Profits from October operations, $32,633.

TONOPAH BELMONT (Tonopah)—Profits for October, $90,872.

GREAT WESTERN CONSOLIDATED (Tonopah)—Two new pumps now in place; will resume development on 1,150-ft. level within few days. Also plans to sink shaft deeper.

TONOPAH MINING (Tonopah)—October profit was $42,110 from treatment of 8,055 dry tons ore; average value, $15.60 per ton. Bullion produced was 134,590 oz., valued at $114,200.

NEW MEXICO

Grant County

BATTLESHIP (Lordsburg)—This group will be explored by churn drills; W. H. Scarborough, owner.

SILVER KING (Central)—Leased by C. M. Becker, N. M. Cudabac and G. H. Howze; have started work and will soon ship two carloads gold-silver-lead ore per week.

CARLISLE (Steeplerock)—Entire face west drift on 500-ft. level in sulphides, lead, zinc, copper, gold and silver; more copper showing with depth.

CHINO (Santa Rita))—South of the "Hearst Pit," more than two acres reported to contain orebody 300 to 500 ft. thick, which averages 1⅜% to 1½% copper.

AUSTIN-AMAZON COPPER (Silver City)—New organization of Charles Davis and D. M. Jackson, of El Paso, M. W. Porterfield and John M. Wiley, of Silver City, to develop and operate claims in Burro Mountains.

EBERLE (Mogollon)—Drifts being advanced both north and south from 50-ft. level in exploratory shaft, equipped with Fairbanks-Morse 15-hp. gasoline hoist and compressor plant. Ore from development sent to custom works. Oaks Co., operator.

HANOVER COPPER CO. (Hanover)—G. A. St. Clair, of Duluth, Minn., has taken principal interest and will operate property on company account in future. Mine is in Hanover Gulch and is principal zinc producer in this section; leasers in October shipped 31 cars of zinc ore. F. G. Walker is now manager.

Sierra County

SHERIFF MINING (Rincon)—Close corporation of El Paso sheriffs to develop deposit of 50% pyrolusite; shipments pay exploration expense and profit.

Taos County

MEMPHIS RED RIVER MINING CO. (Raton)—This company installed flotation plant at its property near town of Red River. Equipment includes C. I. W. ball mill, Dorr classifier, M.-S. type cells and Card tables. W. D. Kershner, president.

OREGON

Baker County

TABER FRACTION MINES CO. (Baker)—James A. Howard and associates, who have optioned the Taber Fraction and Rastus claims, near Sumpter, have shipped three cars and are working 10 men on development.

HOMESTEAD-IRON DYKE MINES CO. (Homestead)—Flotation plant, which began operating Sept. 25, has been working satisfactorily, a 92% extraction being obtained from heads averaging about 3% copper. Mill is of 150 tons daily capacity and uses Janney 7-cell machines. Concentrates averaging 11% copper are shipped to International smeltery at Tooele, Utah. Emmet F. Galligan, superintendent.

UTAH

Beaver County

PALOMA (Milford)—Main incline down to 650 and being sunk to 700 level. On 600, ore carrying copper and lead opened in two places.

CREOLE MINING (Milford)—Stock listed on Salt Lake Exchange; company has 9 claims in Lincoln mining district, 12 mi. from railroad. Development done through 200-ft. shaft, and approximately 1,100 ft. of tunnels, winzes, drifts, etc. Ten men are employed. Returns from 1916 shipments, $41,000—ore carrying copper, silver, lead and gold. N. W. Haire, president.

MOSCOW (Milford)—October shipments amount to 10 cars of lead-silver ore and two cars of zinc ore. So far in November nine cars shipped, and total production of 12 to 14 cars expected. Ore being mined in all parts of old workings. Drift being sent out from new shaft for old workings, which will gain added depth of 300 ft., or total of 1,100 ft. All ore will be sent out through new shaft, which is nearer railroad.

Juab County

KING WILLIAM (Eureka)—Being reorganized; old stockholders on paying ½c. per share will secure equal number of shares in new company.

DRAGON CONSOLIDATED (Silver City)—Ore carrying gold, copper and silver mined adjoining Iron Blossom. Forty tons of milling ore daily shipped to Tintic Milling Co. Iron ore also being shipped.

Salt Lake County

UTAH COPPER (Bingham)—October production 20,324,520 lb., making output for four months over 80,000,000 lb. Further increase in production facilities contemplated.

OHIO COPPER (Bingham)—Mill treating over 2,000 tons daily, under lease to General Exploration, extended to Dec. 1. Property recently inspected by Eastern stockholders.

CARDIFF (Salt Lake)—October shipments were about two cars per day, ore being hauled by team 3 mi. to South Fork, and from there by tractors to Midvale.

UNITED STATES SMELTING (Midvale)—Lead smeltery at Midvale is operating. Working forces recently increased. Huff electrostatic plant is treating between 70 and 80 tons daily from the company's wet concentrator.

BINGHAM AMALGAMATED (Bingham)—Work to be resumed on company account after lapse of some years. From 600-ft. inclined shaft, on 300 level, will drive toward limestone contact. This limestone in adjoining Congor producing 30 to 50 tons copper ore daily.

NEW QUINCY (Park City)—Ore of better grade is being mined. Drifting to west on main level for ore opened in a raise. Two feet of ore reported on east side.

ONTARIO (Park City)—Shaft caved for about a hundred feet, and 1,700 level will be flooded. Due to soft ground Company was timbering. Work will be suspended for about two months in this part of mine until timbering and repairs can be completed. Hoist may be installed, and work done on 600 level.

VIRGINIA

VIRGINIA SMELTING CO. (West Norfolk)—Leaching plant recently destroyed by fire now operating. Rebuilding of plant proceeding under contract with heavy penalties for delays of completion after Jan. 1, 1917.

Halifax County

GROVES COPPER MINE (Keysville)—In northern section of Virgilina district, George S. Groves reports production about 4,000,000 lb. of copper during last few months from 8% ore, taken from a 3- to 6-ft. vein; two shafts, 100 ft. deep; 500 ft. of drifting. Shipping car of ore daily to West Norfolk smeltery, and expects to double output when installation of new equipment is completed. Plant capable of hoisting 100 tons per day.

CANADA

British Columbia

COAST COPPER CO. (Trail, B. C.)—Sinking 400-ft. prospecting winze on claims recently optioned at northern end of Vancouver Island.

RAMBLER-CARIBOO (Slocan)—Contract closed with United States Zinc Co. for sale of 1,000 tons of zinc concentrates. Basis of settlement to be $34 flat for 33% zinc and 28-oz. silver. Net returns to mine will be about $23 per ton, after deducting freight and duty.

Ontario

ORE SHIPMENTS from the Cobalt district over the Temiskaming and Northern Ontario Ry. are reported by Arthur A. Cole, for the month of October, as follows: From Cobalt proper, 1,552.80 tons by the following companies: Aladdin Cobalt, 20.50 tons; Beaver, 40.77; Coniagas, 74.20; Cobalt Comet, 64.38; Crown Reserve, 95.27; Kerr Lake (by Dominion Reduction Co.), 97.85; Kerr Lake Mining Co., 30.23; La Rose, 126.98; Mining Corporation of Canada, 36.96; McKinley-Darragh, 167.53; Nipissing, 649.18; O'Brien, 64.91; Right of Way, 42.03; Trethewey, 42.01. From New Liskeard, by Casey Cobalt, 27 tons; from Elk Lake, by Miller Lake-O'Brien, 28.30 tons; Reeves-Dobie, 11.50; total silver-ore shipments, 1,619.60 tons. From Temagami, by Dominion Rand, 79.29 tons of pyrites; from Porquois Junction, by Alexo, 237 tons of nickel ore.

INSPIRATION (Porcupine)—Diamond drilling has started.

GOLD REEFS (Porcupine)—Sinking shaft from present depth of 30 ft. to the 100-ft. level.

LAKE SHORE (Kirkland Lake)—Installation of new 7-drill compressor is practically completed.

BEAVER (Cobalt)—New vein, 5 to 7 in. wide, opened for 20 ft. on 600-ft. level, carries high-grade ore.

OPHIR (Cobalt)—A 7-in. vein, carrying cobalt, nickelite and some silver, struck in the crosscut at 425-ft. level.

PLATT (Porcupine)—Under option to Coniagas; has been getting good results in diamond drilling. Several veins cut.

GIFFORD (Cobalt)—Decided to increase capital from $250,000 to $1,000,000; will be offered to shareholders at 5c. per share; money to be used in further development.

SCHUMACHER (Schumacher)—Opened new vein, east drift for 30 ft. showing 7 ft. of ore.

KEORA (Porcupine)—Has let a contract for diamond drilling.

McINTYRE (Schumacher)—At joint meeting of directorates of the McIntyre, McIntyre Extension and Jupiter companies, Nov. 23, a tentative basis for amalgamation was decided on. The offer of the McIntyre, if accepted, will be submitted to shareholders for ratification.

NICHOLS COPPER CO. (26 Broad St., New York)—This company has secured option on 160-acre pyrite property, near Mokomon, 31 mi. from Port Arthur, Ont., on the Canadian Northern Ry., belonging to B. L. Morrison, of Port Arthur. Purchase price is $100,000. Shafts and test pits will be sunk and diamond drilling undertaken.

The Market Report

Metal Markets

NEW YORK—Nov. 29, 1916

In all of the metals, business was rather dull during the last week, but all were very strong, lead becoming more conspicuous than it had been previously. Copper was strong from being sold out. Spelter was regarded somewhat suspiciously.

Copper, Tin, Lead and Zinc

Copper—Transactions were in even less volume than in the previous week, being very light indeed. The major market continued to be for delivery in the second quarter of 1917, sales being made at the equivalent of 32¼@32¾c., cash, New York. There were still buyers for that delivery and earlier, and the reason that no more business was done was owing more to the inability of producers to sell than to absence of buying power on the part of consumers. However, it was absolutely clear that buying was no longer of the insistent reckless character of a fortnight previous, and manufacturers who are uncovered are more disposed to stay so and take their chances. There were some transactions for delivery in the third quarter of 1917, and even during the entire second half of that year, but these were confined to certain quarters and seemed to evince a desire by producers to take time by the forelock and place all the copper that could be at high prices.

There was an acute demand from Europe for nearby copper, but neither producers nor anybody else could supply it, so that was the end of the matter. Japanese cathodes, December-January delivery, were reported being sold in France on the basis of £175, which would correspond with 36c, and dealers' prices for December wire bars in England were reported as being 37c.

In this market December copper was quoted at 34@35c. (offered at the latter), and first quarter at 33½@34c., while for second quarter 33c. was asked at the close, all regular terms.

The average price on sales of copper by producers for the first half of 1917 varies among the several agencies, but ranges from about 26½c. to about 27c.

Copper Sheets—The base price for copper sheets has been advanced to 42c., this figure being for hot rolled. Wire is based on 38c.

Tin—In the early part of the week only small business was done. On Monday there was good business, but after that the market became dull. At the opening, spot was 45¼c., futures 44½c. At the close spot was 45¼c. and futures 44⅝c.

Lead—Business was less in volume than in the previous week, but the scarcity of near-by lead became more acute. Independent producers easily realized 7¼c. in the New York market, and corresponding prices in St. Louis, but the A. S. & R. Co. maintained its previous prices and booked business at them with its regular customers, but named higher prices or refused to quote to those who are not its regular customers. Japan bought lead from American producers, paying from 7⅜ to 7¾c., f.o.b., Pacific Coast. The strength of the situation is evinced by lead being sold from the interior to go overland to the Pacific Coast.

The Granby works in Missouri were so badly damaged by cyclone recently that they had to be put out of commission.

The Nassau Smelting and Refining Co. received an order from the government for 100,000 lb. of lead, at 7.12c. per lb., for the District of Columbia, and an order for 300,000 lb. for the Frankford arsenal was given to L. Vogelstein at 7.125c. per lb.

Spelter—Prices continued to advance, although only a relatively small business was done. Europe did not buy. The major part of the business reported was for forward delivery, there being some first-quarter contracts, some second-quarter and some good tonnages placed for first half. It became quite clear that prompt spelter is not so scarce as has been intimated, and while there has been no pressure to sell it—indeed the reverse—there is plenty for sale at an advance. It is suspected that supplies have been held back in order to cover sales of futures, for which considerably lower prices have been accepted than what are asked for prompt delivery. High-grade spelter is 20c. asked, but it probably can be obtained for less, perhaps 18c.

The official statistics of Norway show that in 1915 there were imported into that country 29,582 metric tons of spelter against 16,566 in 1914. The exports were 22,627 and 16,517. These figures may be taken as indicating the extent of the electrothermic zinc refining at Sarpsborg and Ilen.

The Anaconda company is now producing about 2,500 tons of electrolytic spelter per month.

Zinc Sheets—The price of zinc sheets has again advanced, on Nov. 24 the base being placed first at $20 and later at $21 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

Antimony—Market steady at 14½c. There was no great demand and, on the other hand, producers weer rather reluctant to sell at present prices.

Quicksilver—Market receded to $77. San Francisco reports, by telegraph, $75; market steady.

Nickel—The price of nickel remains unchanged at 45@50c. per lb., electrolytic commanding an additional 5c. per lb.

Aluminum—Price is nominally a shade lower, 63@65c. per lb. for No. 1 ingots, New York.

Gold, Silver and Platinum

NEW YORK—Nov. 29

Gold—The net import of gold into India for October, 1916, was about £1,216,500.

Silver has advanced owing to heavy buying for London account. Part of the purchases no doubt rae intended to replenish stock in China, which has been depleted to a large extent by sales some months ago in unusual directions, and part of the buying has been for English Government requirements. Market closes steady to firm.

Under date of Nov. 9, Samuel Montagu & Co., of London, reports that the market has developed considerable strength chiefly as a consequence of firm exchanges from China, where the export season is in full swing. Chinese pressure was felt in other markets more than in that of London, but prices here responded in quick sympathy and somewhat sensational advances have been recorded.

The Indian Bazaars contributed to the competition for supplies as well as the more distant East, while the demand for coinage continues to be active.

The Indian currency figures below seem to indicate that purchases for the Indian Mint are not keeping pace with its requirements.

Platinum—Unchanged at $105 per oz.

Palladium—Unchanged at $75 per oz.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 25—Quotations for the district are according to the following figures: Base price per 2,000-lb. ton for material assaying 60% zinc is $98 for premium ore down to $95 for medium grades. Base price per 2,000-lb. ton for material assaying 80% lead ore is $90. Shipments for the week ended Nov. 25 were: 2,787 tons of zinc ore, 108 tons of lead ore, and 604 tons of sulphur ore. For the year to date the figures are: 118,586 tons of zinc ore, 4,009 tons of lead ore and 28,999 tons of sulphur ore. Shipped during the week to separating plants, 2,954 tons of zinc ore.

Joplin, Mo., Nov. 25—Price quotations per 2,000 lb.: Blende, high, $107.15; 60% zinc, premium ore, $105; medium grades, $100@95; low, $90. Calamine, per ton 40% zinc, $60@50. Average selling price, all grades of zinc, $84.67 per ton.

Lead, high price, $90.85; base, $91@86; average selling price, all grades of lead, $88.21 per ton.

Shipments of the week: Blende, 8,043 tons; calamine, 648 tons; lead, 1,128 tons. Value, all ores the week, $835,200; 47 weeks, $33,604,180.

A buyer seeking a few carloads of lead for shipment into Canada upset the even tenor of prices in some localities, forcing the base price up to $91 for two or three choice bins of galena. Zinc prices were advanced for choice bins $10 per ton and there was an increase of $6 per ton in the average selling price. Where lack of water, the shortage of hydro-electric power or gas troubles have not prevented an increasing output, efforts to increase the output are met with a lack of mine help, several hundred miners having left for the west during the dull summer.

Other Ores

Molybdenum Ore—Quoted at $1.75@1.85 per lb. of MoS_2 contained. Last week we quoted erroneously $1.85 per unit, meaning per pound.

Antimony Ore—Nothing but small business reported.

Manganese Ore imports into the United States for September amounted to 73,536 tons. The imports in July, August and September have been 232,199 tons. The total to Oct. 1, 1916, is now 469,222 tons, against 173,992 tons to Oct. 1, 1915, and 215,274 tons to Oct. 1, 1914. The British imports to Oct. 1, 1916, were only 348,394 gross tons. The monthly rate for the first nine months of this year is 52,136 tons, against a previous record of 28,757 tons per month in 1913.

Imports at Baltimore included 5,000 tons of iron ore from Cuba.

Tungsten Ore—Market active, both on foreign and domestic demand. Europe is reported having bought approximately 100 tons and asking for more. We quote $18 per unit at the close.

Iron Trade Review

NEW YORK—Nov. 29

It appears that the buyers of foundry iron have been expecting the pig iron market to act in the same manner that the steel market has done lately, and the buying for delivery in the second half of 1917 at a price about 50% higher than than that of three months ago represents a notable speculation. There have been large sales of rails for that delivery, and also considerable sales

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
23	4.7569	73⅛	34 11/16	27	4.7569	74	35 1/16
24	4.7569	73⅛	34 11/16	28	4.7569	73⅛	35 1/16
25	4.7569	73⅛	35 1/16	29	4.7569	74⅛	35⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Nov.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
	32¼		7.00	6.90	12¼
23	@32¼	45½	@7.25	@7.15	@12¼
	32¼		7.00	6.90	12¼
24	@32¼	45½	@7.25	@7.15	@12¼
	32¼		7.00	6.90	12¼
25	@32¼	45½	@7.25	@7.15	@12¼
	32¼		7.00	6.90	12¼
27	@32¼	45½	@7.25	@7.15	@12¼
	32¼		7.00	6.90	12¼
28	@32¼	45½	@7.25	@7.15	@13
	32¼		7.00	6.90	12¼
29	@32¼	45½	@7.25	@7.15	@13

The above quotations are our appraisal of the average of the major market based on sales as made and reported by producers and agencies; and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Nov.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
23	144	139	164	191½	193½	30½	58
24	144½	140	165	190½	192	30½	58
25	...	...	...	...	...	...	...
27	147	141	168	190½	192½	30½	58½
28	145	139	169	190	192	30½	59
29	150	142	169	189	190½	30½	59½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. Copper quotations for electrolytic are subject to 3% discount. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21½ cents.

of plates, both domestic and for export. In the steel trade, mills have endeavored to restrict contracts for the future to material covering work for which orders were actually in hand. The foreign demand for pig iron is what has sent prices to a high level.

PITTSBURGH—Nov. 28

Wire products have been advanced $3 per ton, effective yesterday, making nails $3, base, this being the second $3 advance this month. Nails are now double their low price of nearly two years ago, but are still 20c. a keg below the price early in 1900. Nearly all steel prices are at record high levels. Three widely different commodities, sheet bars, plates and rivets, are at three times their price in December, 1914, while practically all other steel products are double priced at least. Prices have become largely nominal, however, as there is little business being done in the familiar form of open contracts and steel required for specific purposes brings different prices according to delivery and other conditions.

The market situation has become still more tense. While it seems impossible for some consumers to pay current prices there is no sign of any break impending and it is suggested that there would be more export buying if domestic consumers should reduce their requirements.

Car shortages are this week more pronounced than ever, and a real cold snap, in keeping with the time of year, would doubtless produce transportation conditions that would result in iron and steel output being curtailed. Hopes are entertained of better car supplies, however, owing to the ruling that cars must be returned to the lines owning them, a movement favorable to the steel industry as the roads serving it own more cars than they have had in their possession, while the Lake shipping season is now practically ended and this should release many cars.

Pig Iron—Pig-iron prices have been advancing almost from one sale to the next. Furnaces are making up for their freedom last August, in selling pig iron for first half of 1917 delivery at the going market or even at cut prices, and are asking very high prices for what little iron remains for the period, or for the much larger tonnage that is unsold for the second half. If price advances are a criterion the market is extremely strong. The local market is now at the highest point in at least a third of a century. A transaction out of line even with the sharply advancing market as testified by other sales is the purchase, according to general report, of 34,000 tons of basic iron for second-half shipment to an Eastern steel works at $30, valley. The market as generally viewed is up $2 a ton on bessemer and basic and $1 on foundry, in the week. We now quote: Bessemer, $33@35; basic, malleable and foundry, $28@30; gray forge, $27.50@29.50, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

E. W. Mudge & Co., merchants in coke, pig iron and steel, have purchased Claire furnace at Sharpsville, Penn., controlled by M. A. Hanna & Co.

Steel—Offerings of unfinished steel are still more restricted and the market is practically nominal at about $55 for billets and $57 for sheet bars, bessemer or openhearth. Rods are $65@70 and forging billets $70@75.

Iron Ore

British Imports of Iron Ore, nine months ended Sept. 30, were 4,709,046 gross tons in 1915, and 5,481,509 in 1916; increase, 772,463 tons.

The ore-carrying rate from ports at the head of Lake Superior for 1917 has been established at $1, net, an advance of 50c. over the rate for 1916. Although earlier in the season an advance of 25 to 35c. was talked of, it has been recognized for some time that in all probability the advance will be 50c., and the action of several leading shippers in making contracts for the season at $1 a ton caused no surprise. Most of the vessel tonnage has already been tied up, and it is probable that the contracts which have just been made will govern on a very large percentage of business to be done, but some vessel owners are holding a part of their tonnage in reserve with the expectation that they will be able to place it at a wild rate higher than the season rate. The new rate is equivalent to $1.10 gross, the highest rate which has prevailed since 1900, when the contract rate was $1.25, while the wild rate for that year averaged 84½c. The starting of iron ore selling for next year has been delayed while awaiting fixing of the ore carrying rate, and it is probable that the new prices of iron ore will be determined shortly. The feeling among many ore men is strong in favor of an advance of at least $1.25 per ton, in favor of an advance up to $1.50. It is probable that the new rate will be somewhere between the two.

Coke

Connellsville—Car shortages are more serious and have cut down production further. Many consumers doubtless stand in need of more coke, but do not attempt to buy in the spot market, as prices are already extremely high. Odd lots purchased fix the market at $7.25@7.75 for spot furnace. Some first half coke could be had at $4@4.50, but consumers are indisposed to take hold. Foundry is $9@10 for spot and $5.50@6.50 for contract, per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 28
Alaska Gold M.	13
Alaska Juneau	8
Am. Sm. & Ref., com.	116½
Am. Sm. & Ref., pf.	116½
Am. Sm. Sec., pf. A	100½
Am. Sm. Sec., pf. B	96
Am. Zinc	56½
Am. Zinc, pf.	79
Anaconda	98
Batopilas Min.	1½
Bethlehem Steel	625
Bethlehem Steel, pf.	155
Butte & Superior	69
Chile Cop.	32
Chino	67½
Colo. Fuel & Iron	55
Crucible Steel	84½
Dome Mines	22½
Federal M. & S.	16
Federal M. & S., pf.	45
Great Nor., ore ctf.	44½
Greene Cananea	52½
Homestake	132
Inspiration Con.	69½
International Nickel	47
Kennecott	56½
Lackawanna Steel	102½
Miami Copper	45
Nat'l Lead, com.	67½
National Lead, pf.	112½
Nev. Consol.	29
Ontario Min.	6½
Quicksilver	2½
Quicksilver, pf.	9
Ray Con.	32½
Republic I. & S., com.	86½
Republic I. & S. pf.	116
Sloss-Sheffield	84
Tennessee Copper	24½
U. S. Steel, com.	126½
U. S. Steel, pf.	121½
Utah Copper	121½
Va. Iron C. & C.	64½

N. Y. CURB†	Nov. 28
Buffalo Mines	1.15
Butte & N. Y.	2½
Butte C. & Z.	15½
Caledonia	.45
Can. Cop. Corpn.	2⅛
Cashboy	.06
Cerro de Pasco	42½
Con. Ariz. Sm.	2½
Con. Coppermines	3½
Con. Nev.-Utah	.28½
Crystal Cop.	½
First Nat. Cop.	4½
Florence	.70
Goldfield Con.	.50
Goldfield Merger	.05½
Granite	.43
Hecla Min.	87½
Howe Sound	7½
Jerome Verde	1½
Joplin Ore & Spel.	.50
Kerr Lake	4⅛
Magma	57
Majestic	.75
McKinley-Dar-Sa.	.60
Mother Lode	.36
Nevada Hills	.21
N. Y. & Hond.	16½
Nipissing Mines	9
Oro	‡.03½
Ray Hercules	5½
Rochester Mines	.72
St. Joseph Lead	21½
Standard S. L.	1½
Stewart	.25
Success	.55
Tonopah	6½
Tonopah Ex.	4½
Tribullion	.25
Troy Arizona	.76
United Zinc	5½
White Knob, pf.	2½
White Oaks	4½
Yukon Gold	2½

SAN FRAN.*	Nov. 28
Alta	.03
Andes	.20
Best & Belcher	.05
Bullion	.02
Caledonia	.30
Challenge Con.	.05
Confidence	‡.20
Cons. Imperial	‡.01
Con. Virginia	.08
Gould & Curry	.03
Hale & Norcross	.11
Jacket-Cr. Pt.	.03
Mexican	.21
Occidental	.65
Ophir	.19
Overman	.03
Savage	.06
Seg Belcher	.02
Sierra Nevada	.22
Union Con.	.55
Utah Con.	.02
Belmont	4.95
Jim Butler	.98
MacNamara	.07
Midway	.20
Mont.-Tonopah	.21
North Star	.15
Rescue Eula	.26
West End Con.	.70
Atlanta	.07
Booth	.07
C.O.D. Con.	.02
Comb. Frac.	.04
D'field B.B.	.06
D'field Daisy	‡.05
Jumbo Extension	.25
Round Mountain	.36
Sandstorm Kendall	.04
Silver Pick	.30
Argo	.06
Ariz. Central	.08
Big Jim	1.43½
Lazy Boy	.07
Nellie	.30
Tom Reed	2.25
United Eastern	4.50
United Western	.05

BOSTON EXCH.*	Nov. 28
Adventure	4½
Ahmeek	120½
Algomah	1½
Alloues	78
Ariz. Com., ctfs.	16½
Bonanza	.40
Butte-Ballaklava	2½
Calumet & Ariz.	91
Calumet & Hecla	625
Centennial	23½
Copper Range	76½
Daly West	3
East Butte	17½
Franklin	11
Granby	105
Hancock	20†
Helvetia	.75†
Indiana	4½
Island Cr'k, com.	63
Island Cr'k, pfd.	92½
Isle Royale	38½
Keweenaw	5
Lake	14
La Salle	5½
Mason Valley	7
Mass	16½
Mayflower	3½
Michigan	4½
Mohawk	100
New Arcadian	6½
New Idria	15
North Butte	26½
North Lake	2½
Ojibway	1½
Old Colony	3
Old Dominion	77
Osceola	98½
Quincy	96
St. Mary's M. L.	104
Santa Fe	2½
Shannon	10½
Shattuck-Ariz.	32
So. Lake	6
So. Utah	.25
Superior	18½
Superior & Bost.	7½
Tamarack	44½
Trinity	7½
Tuolumne	.95
U. S. Smelting	75½
U. S. Smelt'g, pf.	51½
Utah Apex	3½
Utah Con.	21
Utah Metal	7½
Victoria	6½
Winona	5½
Wolverine	54
Wyandot	2

BOSTON CURB*	Nov. 28
Alaska Mines Corp.	.83
Bingham Mines	10¼
Boston Ely	.75
Boston & Mont.	.75
Butte & Lon'n Dev.	.62
Calaveras	5½
Calumet-Corbin	.02
Chief Con.	2½
Cortes	.25
Crown Reserve	.40
Davis-Daly	5½
Eagle & Blue Bell	1½
Houghton Copper	1½
Iron Cap Cop., pf.	12
Mexican Metals	.51
Mines of America	2½
Mojave Tungsten	2½
Nat. Zinc & Lead	.65
Nevada-Douglas	1⅛
New Baltic	3½
New Cornelia	18
Ohio Copper	.35
Oneco	.90
Rex Cons.	.60
Rilla	.07
United Verde Ext.	40½

SALT LAKE*	Nov. 28
Big Four	1.15
Black Jack	.06
Cardiff	7.50
Colorado Mining	.22
Crown Point	.05
Daly-Judge	8.00
Emma Con.	2.37½
Empire Copper	1.50
Gold Chain	.18
Grand Central	.58
Iron Blossom	1.62½
Lower Mammoth	.10
May Day	.10½
Opohongo	.01½
Prince Con.	1.30
Seven Troughs	.03
Silver-King Coal'n	3.22½
Silver King Con.	4.50
Sioux Con.	.15
So. Hecla	1.60
Uncle Sam	.09
Wilbert	.09
Yankee	.23

TORONTO*	Nov. 28
Bailey	.07½
Beaver Con.	.46
Chambers Ferland	.17
Coniagas	4.85
La Rose	.55
Peterson Lake	.18
Right of Way	.05
Seneca Superior	‡.09
T. & Hudson Bay	73.00
Temiskaming	.65
Wettlaufer-Lor.	.11
Dome Exten.	.29½
Dome Lake	.60
Foley O'Brien	.70
Hollinger	6.90
Jupiter	.26
McIntyre	1.75
Newray	1.20
Porcu. Crown	.69
Vipond	.39
West Dome	.33

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Nov. 28
Cresson Con.	8.75
Doctor Jack Pot.	.09½
Elkton Con.	.10
El Paso	.40
Findlay	.01
Gold Sovereign	.07
Golden Cycle	2.79
Granite	.65
Isabella	.23½
Mary McKinney	.28
Portland	2.05
Vindicator	1.65

LONDON	Nov. 16		
Alaska Mexican	£0	12s	6d
Alaska Tre'dwell	2	17	6
Burma Corp.	4	0	0
Cam & Motor	0	11	6
Camp Bird	0	7	0
El Oro	0	8	3
Esperanza	0	10	0
Mexico Mines	3	15	0
Nechi, pfd.	0	12	0
Oroville	0	16	9
Santa Gert'dis	0	10	9
Tomboy	1	1	3

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1914	1915	1916	1914	1915	1916
January	56.572	48.855	56.775	26.553	22.731	26.960
February	57.506	48.477	56.755	26.573	22.753	26.975
March	58.067	50.241	57.935	26.788	23.708	27.597
April	58.519	50.250	64.415	26.958	23.709	30.662
May	58.175	49.915	74.269	26.704	23.570	35.477
June	56.471	49.034	65.024	25.948	23.267	31.060
July	54.678	47.519	62.940	25.219	22.597	30.000
August	54.344	47.163	66.083	25.979	22.780	31.498
September	53.290	48.680	68.515	24.260	23.591	32.584
October	50.654	49.385	67.855	23.199	23.925	32.361
November	49.082	51.714	71.604	22.703	25.094	.....
Dec.	49.375	54.971	.....	22.900	26.373	.....
Year	54.811	49.684	.....	25.314	23.675	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1915	1916	1915	1916	1915	1916
Jan.	13.641	24.008	60.756	88.083	65.719	116.167
Feb.	14.394	26.440	63.494	102.667	*	133.167
Mar.	14.787	26.310	66.152	107.714	*	136.000
April	16.811	27.895	75.096	124.319	*	137.389
May	18.506	28.625	77.600	135.457	*	152.522
June	19.477	26.601	82.574	112.432	95.333	137.455
July	18.796	23.865	76.011	95.119	91.409	125.500
Aug.	16.941	26.120	68.673	110.283	82.333	126.304
Sept.	17.502	26.855	68.915	113.905	85.250	134.071
Oct.	17.686	27.193	72.601	122.750	88.000	142.523
Nov.	18.627	30.625	77.744	.....	93.273	.....
Dec.	20.133	.....	80.773	.....	100.430	.....
Year	17.275	.....	72.532	.....	.....	.....

Tin	New York		London	
	1915	1916	1915	1916
January	34.260	41.825	156.550	175.548
February	37.415	42.717	176.925	181.107
March	48.426	50.741	180.141	193.609
April	47.884	51.230	166.225	199.736
May	38.790	49.125	162.675	196.511
June	40.288	42.231	167.636	179.466
July	37.423	38.510	167.080	168.357
August	34.389	38.565	151.440	169.870
September	33.125	38.830	152.625	171.345
October	33.080	41.241	151.554	179.307
November	39.224	44.109	167.670	.....
December	38.779	.....	167.000	.....
Av. year	38.590	.....	163.960	.....

Lead	New York		St. Louis		London	
	1915	1916	1915	1916	1915	1916
January	3.729	5.921	3.548	5.826	18.606	31.167
February	3.827	6.246	3.718	6.164	19.122	31.988
March	4.053	7.136	3.997	7.375	21.883	34.440
April	4.221	7.630	4.142	7.655	21.094	34.368
May	4.274	7.463	4.182	7.332	20.347	32.967
June	5.932	6.936	5.836	6.749	25.170	31.011
July	5.659	6.352	5.531	6.185	24.611	28.137
August	4.656	6.244	4.520	6.088	21.946	29.734
September	4.610	6.810	4.490	6.699	23.151	30.786
October	4.600	7.000	4.499	6.898	23.994	30.716
November	5.155	7.042	5.078	6.945	26.278	.....
December	5.355	.....	5.266	.....	28.807	.....
Year	4.673	.....	4.564	.....	22.917	.....

Spelter	New York		St. Louis		London	
	1915	1916	1915	1916	1915	1916
Jan.	6.386	16.915	6.211	16.745	30.844	89.810
Feb.	8.436	18.420	8.255	18.260	39.819	97.762
Mar.	8.541	16.846	8.360	16.676	44.141	95.048
April	10.012	16.695	9.837	16.525	49.888	99.056
May	14.781	14.276	14.610	14.106	68.100	94.217
June	21.208	11.752	21.038	11.582	100.614	68.591
July	19.026	8.925	18.856	8.755	97.250	50.750
Aug.	12.781	8.730	12.611	8.560	67.786	51.587
Sept.	13.440	8.990	13.270	8.820	67.841	52.095
Oct.	12.800	9.829	12.596	9.659	66.536	54.159
Nov.	15.962	11.592	15.792	11.422	88.409	.....
Dec.	15.391	.....	15.221	.....	89.400	.....
Year	13.230	.....	13.054	.....	67.553	.....

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton. * Not reported.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1915	1916	1915	1916	1915	1916
January	$14.59	$21.60	$13.45	$18.78	$13.90	$19.70
February	14.55	21.16	13.45	18.93	13.90	19.51
March	14.55	21.81	13.45	19.20	13.95	19.45
April	14.55	21.65	13.45	18.95	13.95	19.45
May	14.61	21.78	13.60	19.11	13.83	19.58
June	14.70	21.95	13.67	18.95	13.77	19.34
July	14.94	21.95	13.91	18.95	13.68	19.20
August	16.01	21.95	15.31	18.95	14.75	19.25
September	16.86	22.88	15.95	19.58	15.70	19.53
October	16.95	24.61	15.96	21.26	15.80	21.51
November	17.57	.....	16.47	.....	17.20	.....
December	19.97	.....	18.44	.....	18.95	.....
Year	$15.82	.....	$14.76	.....	$14.95	.....

‡ As reported by W. P. Snyder & Co.

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